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Systematic Production Control of Small Parts

By Frank J. Oliver, Jr.
Editorial Staff, American Machinist

Manufacture for parts stock based upon weekly requirements as determined by past sales analyses—Calculation of the economic manufacturing quantity takes into account all possible factors

IN THE Bloomfield (N.J.) Works of the General Electric Co., a large variety of intricate electric control apparatus is made. As many as 200 parts may enter into a single unit, such as a hand starting compensator, so that a systematic control of production is essential.

The general scheme is to manufacture for parts stock at such a rate as will maintain an economical inventory in relation to predicted sales. Manufacturing orders, as they are called, originate with the commercial department of the home office. Complete analyses of sales for the past year are made and taking into account the effort to be devoted to the sale of a particular product, a prognostication is made as to the probable sale in the next six months. On a suitable form, the commercial department informs the factory production department what they will require, say 900 compensators, size A, classification B, during the latter half of 1927. The production department is guided by this estimate, but in certain special cases, for instance, where a sudden change in the

ARTICLE PU 2049194
DESCRIPTION Box
K1 Size 1 (1)
RAW MATERIAL Cover stock steel .125 x 29" x 108"
ORDERING DIRECTIONS So Req'd.

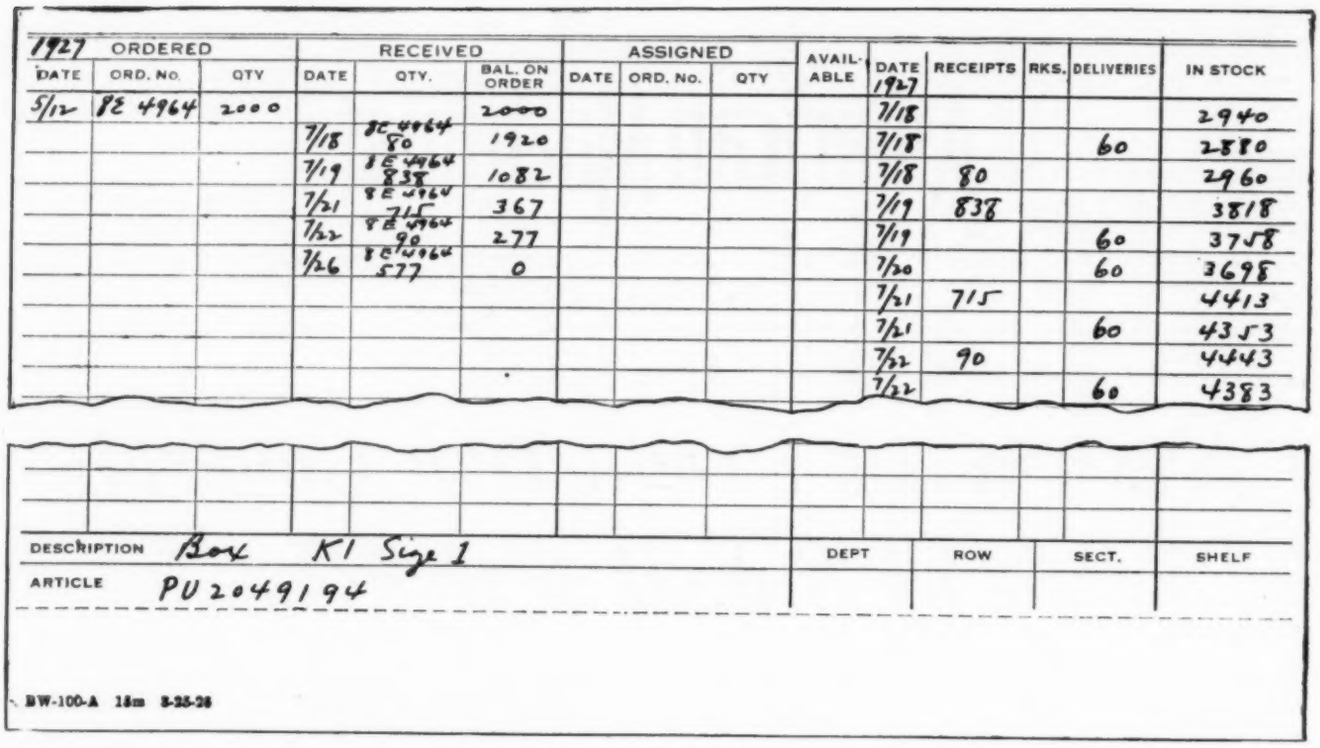
DATE	7/9/26		7/29/27
WKLY. REQTS.	500		340
WEEKS REQD.	8		8
MAXIMUM	7000		4760
ORDER POINT	5000		3400
ECONOMY QTY.	1500		1500

COMPENSATOR STORES

ON HAND	DATE ORD.	DATE WTD.	ON ORDER	ASSIGNED	DATE ORD.	DATE WTD.	AVAILABLE	QTY.	DATE ORD.	DATE WTD.	S.O.
2604			2872	0			5476	2000	4/30	6/24	8E4667

MONTHLY CONSUMPTION			
MO.	19 27	19 ____	19 ____
J	1810		
F	1405		
M			
A			
M			
J			
J			
A			

Fig. 1 — On the stock control card is placed the usual identification in the upper left-hand corner, and in the opposite corner basic inventory control information, such as weekly requirements, the weeks required to manufacture, and the economic manufacturing quantity. A journal account of orders is placed below



1927 ORDERED			RECEIVED			ASSIGNED			AVAIL-ABLE	DATE 1927	RECEIPTS	RKS.	DELIVERIES	IN STOCK
DATE	ORD. NO.	QTY	DATE	QTY.	BAL. ON ORDER	DATE	ORD. NO.	QTY						
5/12	SE 4964	2000			2000					7/18				2940
			7/18	SE 4964 80	1920					7/18			60	2880
			7/19	SE 4964 838	1082					7/18	80			2960
			7/21	SE 4964 715	367					7/19	838			3818
			7/22	SE 4964 90	277					7/19			60	3758
			7/26	SE 4964 277	0					7/20			60	3698
										7/21	715			4413
										7/21			60	4353
										7/22	90			4443
										7/22			60	4383

DESCRIPTION Box K1 Size 1

ARTICLE PU2049194

DEPT	ROW	SECT.	SHELF

BW-100-A 18m 8-25-28

Fig. 2—On this card a detailed record of the receipt and withdrawal of material in stock is recorded. The entry of receipt is made from the inspection tag; withdrawals are noted from orders on the stockroom issued by foremen

trend of sales takes place, modifications are made in the quantity to be manufactured according to the judgment of the production department. To be on the safe side, for example, it may be decided to manufacture 1,200 compensators, or, what is actually done, the demand is broken down into weekly requirements, in this case, 48 units. Once the weekly requirements are determined, the system functions automatically until a subsequent manufacturing order forces a change either up or down in the weekly rate. By the above it is not meant that, in the example, 48 units are made each week, but that this basic figure is used in establishing maximum and minimum stock to be maintained and the economic manufacturing lot, as will be explained later. In effect, the commercial department states what it thinks it can sell in a certain period and leaves it up to the production department to meet deliveries in the most economical manner.

Should the sale of the particular product drop off rapidly, it is necessary only to cancel all shop orders not in process and to set a new and lower rate. If a line is discontinued entirely, parts to make complete sets are matched up and the odds and ends scrapped. The loss is usually very small.

The mechanical production control of each part entering into a unit is maintained by means of a horizontal visible filing system. When a flap is folded back two cars are exposed. The upper one *A*, Fig. 1, is buff in color and is the general control card, while the lower white card, Fig. 2, is used for recording the details. On card *A* the usual identification is placed in the upper left-hand corner, while opposite is placed basic inventory-control information, such as the weekly requirements, the weeks required to manufacture, maximum inventory, the order point, and the economic manufacturing quantity. The weekly requirements are determined from the manufacturing orders from the commercial department, as noted above, and the weeks required to manufacture the part are found by taking into account the amount of time necessary for paper work, actual manufacture and inspection, including the "loading time" of the machine. This last item is based on the average number of orders ahead on a general class of machines, such as punch presses. The maximum number of parts to be maintained in stock is determined from the following formula:

$$\text{Max.} = A(B + \tfrac{1}{2}B + 2)$$

where A = quantity required weekly
B = weeks required to manufacture

When broken down the formula reads:

$\text{Max} = AB + \frac{AB}{2} + 2A$, where AB is the basic quantity required (in other words, before the next lot could be manufactured, AB parts would have been withdrawn from stock) to which is added half as much again $\left(\frac{AB}{2}\right)$ for safety, and to which is further added two weeks' supply ($2A$) as a bumper stock.

The order point of minimum stock is given by the

SHOP ORDER Mr Miller			
S.O. SE-6971	REG.	QUANTITY 200	DATE 7/11
CASTINGS RAW MATERIAL } WANTED		WANTED COMPLETE 8/22	

DESCRIPTION

Mr Miller make:- 200 Cables
K-361354 Gr-4
Deliver to Compensator Stores
28 Agins/L

ISSUED BY.....

Fig. 3—A typical shop order in its usual form is white. If the order is scheduled for an earlier date than the standard manufacturing time, a pink form is used

formula derived from the first:

$$\text{Min.} = A(B + 2)$$
$$= AB + 2A$$

The order quantity is therefore the difference between the maximum and minimum points, or $\frac{AB}{2}$. This figure is not always used, however. In a great many cases, an economical manufacturing quantity is derived as will be explained later. In Fig. 1 is shown a typical example wherein on April 30, 2,604 parts were on hand and 2,872 on order, making 5,476 pieces available. This quantity is so near the order point, 5,000, that 2,000 additional parts were ordered. Note that the wanted date is 8 weeks ahead in accordance with the number of weeks required to manufacture. On the white card, Fig. 2, the detailed entries of receipt and delivery are placed. When finished parts are delivered to the stockroom, the accompanying inspection tag, properly O.K.'d, is sent to the file clerk who makes the proper entry on the card and files the ticket in chronological order. Similarly, when an assembly foreman presents an order on the stockroom for the part in question, the order slip eventually finds its way to the file clerk, who makes the entry. If the withdrawal brings the inventory near or below minimum, the buff card is withdrawn and presented to the stock supervisor. At his discretion a shop order is issued. To give an idea of the problem involved, it may be said that one division of the stores (classified as to products) initiates over a thousand shop orders per month. A typical shop order is shown in Fig. 3. If the order is scheduled for an earlier date than the standard manufacturing time, a pink form is used instead of the usual white one. There are also kept two raw-material forms, exactly the same in appearance, but containing slightly different information. One card is filed by the part number and merely contains on its front side the kind of material, its size, and weight per unit quantity; for example, pounds per 100 or 1,000 units. The same information as to part-stock requirements as contained in the form Fig. 1, is also placed thereon. On the reverse side the designation of apparatus with which the part is used is listed as well as the quantity required per device. A record of the weekly requirements is also kept from month to month. The other raw material card contains on its

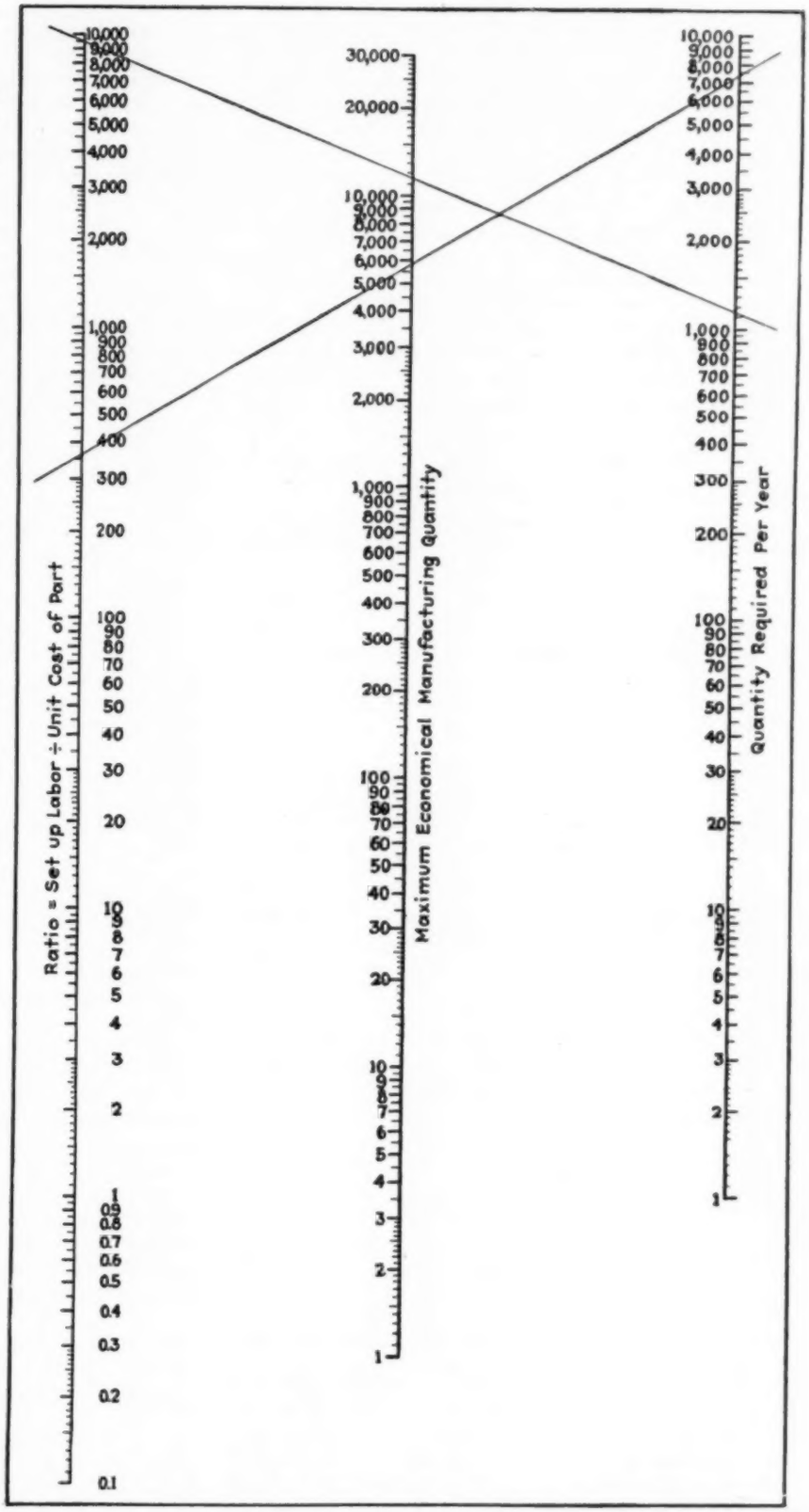


Fig. 4—Chart for determining maximum economical manufacturing quantity. The ratio of set-up cost to unit cost is located on the left-hand scale and the quantity of units required per year on the right-hand scale. The point where a line connecting these first two points intersects the middle line gives the maximum economical manufacturing quantity. Where the annual requirements are in excess of 1,000 units, the requirements are divided by 10 and the ratio multiplied by 10. The economic quanity obtained should be reduced when there is risk of loss due to obsolescence or deterioration, or where space is limited

face a complete description of the material and on the reverse side a tabulation of the various parts into the manufacture of which it enters. For each part there is recorded the weight per unit quantity and the weight of stock to meet the weekly requirements. The weekly requirements may then be totaled for all parts requiring this material. This is as far as raw material control goes from this end. In another department the flow of stock is controlled much in the same manner as described for finished parts.

It was mentioned above that the economical manufactuirng quantity was determined in a special manner. The quantity is given by a formula that takes into account the yearly quantity, the cost per piece, the cost of set-up and interest on inventory. An attempt is made to compromise these factors. The formula is as follows:

$$\text{Economic quantity} = x = \sqrt{\frac{dn}{a \times 0.08}}$$

Where d = cost of set-up
n = number of pieces required annually
a = cost of material, labor and overhead per piece (M.L.O. cost)

$$\text{Cost per piece} = \left(\frac{d}{x} + a\right)\left(1 + \frac{0.08}{n}x\right)$$

The figure 0.08 represents 8 per cent interest upon investment in inventory. For example, let us take a brass washer having a yearly consumption of 11,400, where the set-up cost is $0.57 and the M.L.O. cost per piece $0.0006.

Then, economic quantity $= \sqrt{\frac{0.57 \times 11{,}400}{0.0006 \times 0.08}} =$ 11,600, or more than the yearly requirement. The cost per piece would be

$$\left(\frac{0.57}{11{,}600} + 0.0006\right)\left(1 + \frac{0.08 \times 11{,}620}{11{,}400}\right) = \$0.0007$$

or 70 cents per thousand.

If, on the other hand, we had a case where the cost of material was appreciable, the economic quantity would be low. For example, let us take a copper part having a yearly consumption of 75,000, a set-up cost of $0.55 and an M.L.O. cost per piece of $0.0154, or 25 times as much as in the first example. Then,

$$\text{Economic quantity} = \sqrt{\frac{0.55 \times 75{,}000}{0.0154 \times 0.08}} = 5{,}800, \text{ or}$$

6,000 call. The cost per piece would be

$$\left(\frac{0.55}{6{,}000} + 0.0154\right)1 + \left(\frac{0.08 \times 6{,}000}{75{,}000}\right) = \$0.0156, \text{ or}$$

$15.60 per thousand.

By resolving the ratio $\frac{d}{a}$ into one figure, we have only two variables, and it is possible to use an alignment chart, such as the one shown in Fig. 4, on which the two problems have been solved. The ratio of set-up cost to unit cost is located on the left-hand scale and the quantity of units required per year on the right-hand scale. The point where a line connecting these first two points intersects the middle lnie gives the maximum economical manufacturing quantity. Where the annual requirements are in excess of 10,000 units, the requirements are divided by 10 and the ratio multiplied by 10. The economic quantity obtained should be reduced when there is risk of loss due to obsolescence or deterioration, or where storage space is limited.

In calculating the cost per piece and the set-up cost, it is convenient to use a mimeographed form, in which space is provided for listing, for each operation, the machine upon which it is performed, the cost per unit quantity (100, 1,000, etc.) and the set-up cost. These figures can be totaled and the ratio between the sums obtained. Space is also provided for noting the annual requirements and the economic order quantity, obtained from the chart. The calculation sheet can then be filed for future reference under the part number.

To summarize, the maximum and minimum inventory are determined, in the final analysis, by sales records and the most economical manufacturing quantity is determined mathematically with all factors taken into account. Ordering for stock therefore is largely mechanical, but it is subject to the judgment of the stores supervisor in borderline cases. For this reason a large amount of paper work can be carried on by a very small staff of clerks headed by a supervisor.

Lettering Shop Drawings
Discussion

By Charles S. Hazard

IN AN article under the title given above, on page 163, Vol. 68, of the *American Machinist*, David T. Fletcher discusses my article on page 799, Vol. 67, of the same journal.

While Mr. Fletcher's approval of my suggestion is gratifying, I do not consider his method of making the figure 4 closed at the top and the figure 9 by a straight down-stroke, any improvement over my method. I cannot match Mr. Fletcher's generation of experience, but in my few years I have seen many a closed figure 4 that looked like a 9, and a great many straight down-stroke 9s that were read as 4s. Never yet have I seen an open-topped figure 4, made with a slanting initial stroke, that could be mistaken for a 7. Since Mr. Fletcher's 9 can be read as 6 if held upside down, as easy as mine, the real cure for this trouble is to make heavy, noticeable "inch marks" after all whole-number dimensions.

After this question of style of lettering is settled, perhaps someone will suggest a way of forcing all draftsmen to do two more things for the improvement of shop drawings. First, put center-distances between holes on every drawing, instead of showing only the dimensions from the edges of the part; and second, always give complete chains of dimensions, instead of giving one or two dimensions from each end of a part, and leaving a gap in the middle.

Marking Drill Shanks
Discussion

By S. P. Rockwell

IN HIS article on page 313, Vol. 68, of the *American Machinist*, on "Marking Drill Shanks," it would seem that Mr. Hewitt has entirely disregarded the heat-treating difficulty which would undoubtedly accompany grooving the drill shanks as he has shown. This groove with its sharp corners would endanger seriously the drills, cracking them when they are subjected to heat-treatment, especially since the shank is hardened as well as the flutes.

About Wage Incentives

MR. HOLLAND dropped in to see Hartwell of the Hartwell Machine Company the other day, in passing, and Hartwell hardly let him get his coat off before he began asking him about wage incentives.

"I want your advice about bonuses and premiums, Mr. Holland. Been thinking I'd like to try something to help the boys along a bit."

"In the first place, Hartwell, I don't often give advice—though I'll be glad to tell you what some other shops do. Secondly, however, don't tell the boys in the shop you want to do something for them. They'll be suspicious even if you mean it. Tell them you want to try a plan that will make more money for them and for you at the same time, and that's as it should be."

"Which do you prefer, Mr. Holland, piece work, premium or bonus?"

"It really doesn't matter much when rates are set fairly and both sides play the game. But it isn't easy to play absolutely square—and mighty few have the backbone to do it—on either side.

"You set a rate that seems fair, based on day work and tell the boys to go to it—there'll be no rate cutting. And then some bright lad fudges up some new method and breaks loose. First thing you know he's earning double the regular wage."

"Well, he'd be getting out twice the production wouldn't he, Mr. Holland? And I'd be getting twice the work out of the machine, wouldn't I?"

"You sure would. But it wouldn't be long before you'd be wondering if you were not paying him more than necessary. If you didn't, some of your directors would—and 'call' you. Then you'd have to fudge up some excuse for cutting the rate—the boys would find that there is a limit to what they can earn without inducing a cut, and production would never rise above that point."

I don't think my men would 'soldier', Mr. Holland."

"And they don't think you'd cut a rate after saying you wouldn't. But both things do happen—especially with straight piece work."

"Anything else to suggest, Mr. Holland?"

"A lot of concerns have found the Halsey premium plan, that was described in the *American Machinist* 'nigh on to forty years ago' a good plan to start with at least—and many still use it."

"I've heard of it, of course, but just how does it work?"

"Simple enough, Mr. Hartwell. You just divide the savings with the men who increase their output. A fifty-fifty split appeals the most but some only give a quarter of the savings. Others find it better to set a new time standard and give the fifty-fifty. Still others work it just opposite and don't time-study at all. They offer a lower split, and depend on the men to work out better methods. Depends a lot on the shop and the kind of work."

"I know you don't go in for definite advice, Mr. Holland, but just forget your scruples for a minute and tell me how I could apply such a scheme in this shop. Can't you give me a definite example?

"Suppose you have a job that takes eight hours. You tell your man that he gets half the time saved. If he does it in six hours he gets paid for seven hours and has the seventh hour to work on another job. You have two hours extra work out of the machine equipment besides the saving of one hour's wages on that job.

"One great advantage is that the manager sees his share of the saving as well as the extra money earned by the men. The more the men earn the more profit you can see. That's why the premium plan, in some form or other, has lasted so long, I think."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

EXECUTIVE FORUM

Discussion

How Much Shall the Proprietor Draw in a Small Shop?

It is apparent that while Jack Shepard may have been a good mechanic he lacked business training. No small shop can charge less than one dollar and a half per hour. One dollar an hour for proprietor is ridiculous and will wreck his business in six months, unless he has capital to waste. Frankly, no small shop operating on the basis of the shop of Jack Shepard will ever grow big. The shop Mr. Holland mentions is operated on an improved basis, still too haphazard.

Before attempting to go into business, we must analyze prospects of success, considering operating costs, volume of business possible, number of similar shops in city, location, experience, and business education.

In most cases small shops, primarily jobbing and tool shops, are started on the spur of the moment. This is a serious mistake and the shop is in constant difficulty.

Bill Holland is absolutely right in his remarks. Regardless of size of shop, it requires someone for soliciting business, purchasing materials, cost accounting, selling, looking after power, heat, maintenance. When the proprietor is forced to handle these functions, what time has he for actual work?

Small shops are not successful unless the volume of business is sufficient for the employment of not less than twelve men, plus a helper and a bookkeeper. They must be able to operate at a net profit of not less than ten per cent above operating cost, including proprietor's salary.

At times a service charge is agreeable to a customer, providing it is explained personally in a diplomatic manner. —PAUL LINDNER.

Allowances for Old Machines

As between two machines which will do his work equally well, a manufacturer ought to buy the one which he can secure at the lowest net price, that is, the price after deducting any allowance offered for his old machine. Although it may be bad business policy for the seller to cut his price by offering a fancy trade-in value for some worn-out machine, or to make other special inducements, that is none of the buyer's affair. It certainly is good business for him to accept any concessions offered when the machines he is considering are equal.

But how often are two machines actually equal? One machine is bound to have some point of construction that will make it more suitable for the job than the competing machine. A slight difference in the location of the controls, or in the oiling system, or in the spindle construction, may easily save enough money to offset a sizeable difference in the first cost.

A careful, searching analysis of each machine, made jointly by the production executives (including the department foreman), should be the big factor in deciding which machine to buy. If a new or unfamiliar type of machine is under consideration, it pays to send them all to the factory where the machine is built to see its construction and operation.

Two cents saved per piece, by choosing the correct machine for the job, will amount to a great deal more than the hundred dollars the purchasing department thinks it saves by "dickering" over the trade-in value of some worn-out machine.

—CHARLES SPRAGUE HAZARD.

Handling Decreased Production

In a business slump there are other things to be done which Mr. Holland has not taken into consideration before reaching the conclusion that Mr. Hawthorne must either lay in a stock of machines and machine parts, or discharge some of his employees. Mr. Holland seems to dwell on the kind of machine, standard or special, that Mr. Hawthorne manufactures, which, though important, is not necessarily the most vital factor when the length of time the depression is expected to last and the general condition of plant machinery, etc., are considered.

In the case of a plant which suffers the yearly seasonal depression of business, the routine covering this period has been well worked out. In the case of the Ranley Manufacturing Company, it is apparently an unexpected slump in sales that has occurred. The letting-go of any employees leaves a very deep impression on the men in the organization which in turn seriously affects the production of the plant. It also delays the company in returning once more to an efficient-running organization. This sudden drop in sales gives the Ranley Company a fine opportunity to make the numerous repairs and the rearrangement and adjustments which the press of business had heretofore forced the management to postpone.

The cheaper, unskilled men, who usually consume a large percentage of material as against their wage, could be divided into gangs under a skilled man and devote themselves to doing the following: thorough cleaning of the machines, assisting the stock department in inventory or re-arranging stock, a thorough scraping and removal of excess paint from spray hoods, etc.,

in the paint department; re-painting various machines and walls.

The experienced mechanics may devote their time, as Mr. Holland suggests, to the building of standard parts wherein labor is the large factor. A group of these men may also check and repair gages, tools, etc.

The electrical division might clean all motors, turn off commutators, replace worn-out drop-light wires; replace brushes in all motors difficult to reach under normal working conditions; run in new lighting circuits to improve the illumination of dark corners.

The engineering force might divide its time between designing and supervising the making of more efficient jigs and fixtures, and working on ideas for improvements in the present machine or entirely new models.

The executives during this period are given a fine opportunity to check up their future policies as to types of machines, advertising methods, and numerous other details that are usually laid aside under press of business.

On the return of normal business, at any moment the entire force will be on hand to immediately get under way. With machinery and tools improved the resulting production cost will be lower and the men, themselves, will feel more secure and more willing to co-operate with an organization that does everything in its power to help them by keeping them employed during a period of depression. —J. J. SPENCE.

The Privileged Class

I suspect that the engineers of an organization do look like the privileged class to the man on the outside. Yet I am inclined to seriously question Arthur Wales, the production chief, when he so vigorously berates them from this outsider's viewpoint. He rightly accused the engineers of not trying to get the production viewpoint, but in the very vigor of his attack he laid himself open to the same criticism with respect to his utter lack of knowledge of the engineer's position and problems.

First, and foremost, engineers are not so many production units of man-power that can be moved about from job to job *ad lib*. Engineering, in its truest sense, is not repetitive work but the highest caliber of creative work. Successful creative work requires continuity of thought—you can't get good design work if the chief engineer continually interrupts a man in the midst of a big engineering development job to get out some special rush changes or advance lists of raw materials on a job the design of which has not yet been determined. Nor, just because they are all generally classed as engineers, can you put any engineer on any job with every assurance of speed and success. You have no more right to expect this than if you took a punch-press operator and put him on a precision lathe just because both men's jobs came under the general classification of machinist.

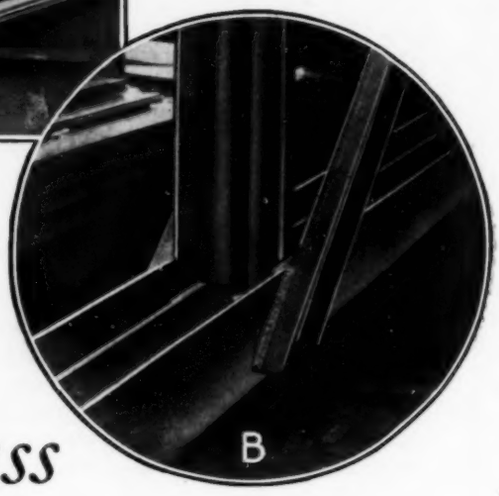
Engineers tend to specialize, not only with respect to a given basic field, but also within a given organization. If you want to change the design of a complicated machine in a hurry to overcome a suddenly developed fault, it is obvious that it's not good business to put on it an engineer who has never even seen the drawings. Yet the man who designed the machine and who knows it intimately may be in the midst of an entirely different—yet also rush—job.

Now suppose the right engineer for the job looks as though he'll finish his present job tomorrow night and the chief decides to save time and worry by waiting for him. To the uninitiate perhaps the product of an engineer is the lines upon a drawing. If that were so, you could estimate a man's ability to make lines with a fair degree of accuracy and know pretty closely when he would be available. But it's not pretty pictures as represented by lines but the ideas back of them, that are the real product of the engineer. And no one has yet been able to infallibly measure a man's ability to conceive ideas (and they must be good) at so many an hour. So ideas come a little slow at the end of the particular job, and the engineer is not quite finished at the end of tomorrow. Shall the chief break off the engineer on the tail end of a job that represents a month or more of work to get out this little two-day rush job, with its attendant loss in picking up the threads of the big job again, or shall he wait just a day or two more, and get the big job finished and out of the way permanently? That's one of the chief engineer's problems.

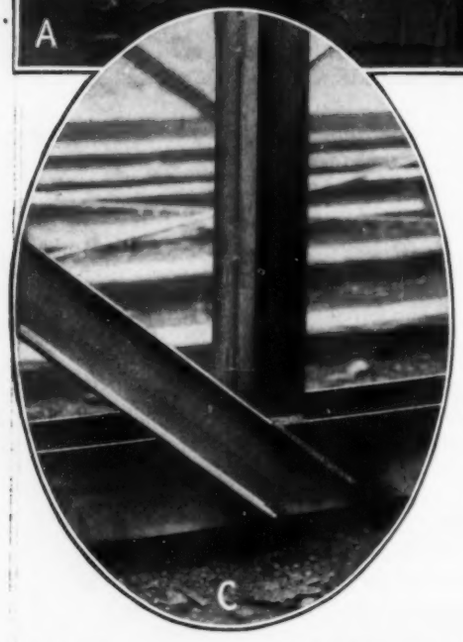
A given job is all ready to finish on schedule in the engineering department. The design is reasonable, satisfactory, and will work. It's a highly productive job and an improvement in design occurs to the engineer on the job that will save some real time in the shops. All right, shall the chief engineer meet his schedule as planned, or shall he be unselfish enough to accept the onus of a delay if he can authorize an improvement that will reduce shop time and save money greatly in excess of design cost? If he were dealing with Wales he might be tempted to meet the schedule; but he won't, he'll take the delay for the good of the job, and because he's an engineer—and this is his weakness—he won't try to explain the circumstances unless he's pressed.

So, if the engineers have a better working environment than the shop, it's not because they are the privileged class and get away with it; rather it's because the management realizes that quiet surroundings with plenty of light and air stimulate and keep alert the mind, and it's the product of the mind they are hiring. And incidentally, just because an engineer at any given time is not pushing his pencil is no indication that he's not working. —BERNARD F. MCCORMACK.

A—Two roof trusses under construction in the shop of the American Bridge Company. The one at the left is just being set up, the various members being held in place by C-clamps. It is given a 2-in. camber by means of hard-wood blocks inserted between the center of the lower chord and the guiding straight edge. The camber is clearly visible in the truss at the right which has been turned over to have the arc welds on the underside completed



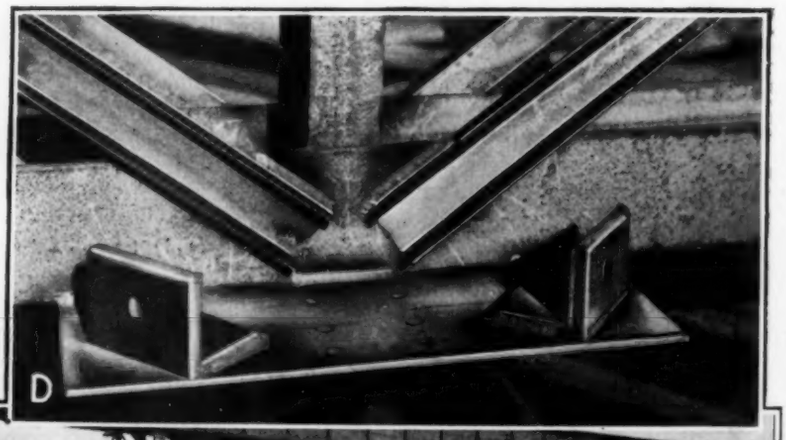
B—Close-up of welds at a panel point



A Roof Truss Designed to Be Welded

Photographs by Courtesy of the General Electric Company

C—Another close-up of a panel point. This one shows the tack welds used to hold together the two channels that form a compression member



D—Close-up of panel point welds showing lugs for connection of sway-bracing rods

E—The finished truss, 58 ft. in length, being set in position for an overload test

Accuracy in Large Machine Tools

By H. K. Smyth and W. C. Wais

Constant temperature maintained in room where standard gages are kept—A long measuring machine—Aligning large machine tools—All cylindrical work finished by grinding

ACCURACY in building machine tools is important for several reasons. Unless they are accurate, the work they produce will not be satisfactory. And unless they are made to shop standards, it is impossible to reproduce them in case fire, flood, or other disaster should destroy the tools, gages, and fixtures used. The need of accuracy applies as much to large machines as to small, even though the problems of alignment are much more difficult. The methods used by the Niles Tool Works Company, Hamilton, Ohio, in securing the required accuracy in building large machinery are of particular interest, and some of them are illustrated herewith.

One of the first requirements is to maintain a system of rigid tool inspection. Then, there must be an adequate supply of sizing tools, such as reamers, boring tools, etc., and a sufficient quantity of standard measuring tools, such as plugs, ring and snap-gages, micrometers, and whatever special gages may be needed to handle the work. Master gages and standard measuring blocks must, of course, be provided to check the measuring tools used.

All measurements emanate from a standards room equipped with two Pratt & Whitney measuring machines. The smaller machine has a capacity of 80 in., and the larger machine of 30 ft. A constant temperature of 68 deg. F. is maintained in this room, so that the precision tools are not affected by fluctuations of heat and cold. In this room there are also Hoke gage blocks, P. & W. super-micrometers, standard end measures, and plug and snap-gages, none of which are used except in the production and checking of working gages or measuring devices.

Another large room has also been set aside for the orderly storage of master arbors and mandrels, jigs, fixtures and gages, as well as working surface plates, straight-edges, and other special tools and apparatus, together with measuring implements used in the manufacture of the company's products. Owing to the great weight and bulk of most of these tools, this room is served by a 10-ton electric traveling crane with transfer service to the cranes in the machine and erecting shops.

The 30-ft. measuring machine is shown in Fig. 1, and the 80-in. machine in Fig. 2, while Fig. 3 gives a good idea of the tools and fixtures to be found in the tool storage room.

Great importance is given to the accurate sizing of holes, and the special reaming machine shown in Fig. 4

The first part of the article. The conclusion will appear in an early issue.

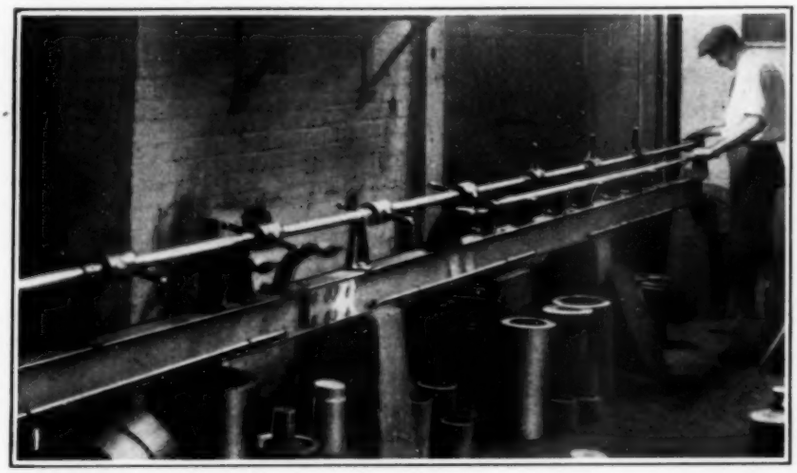
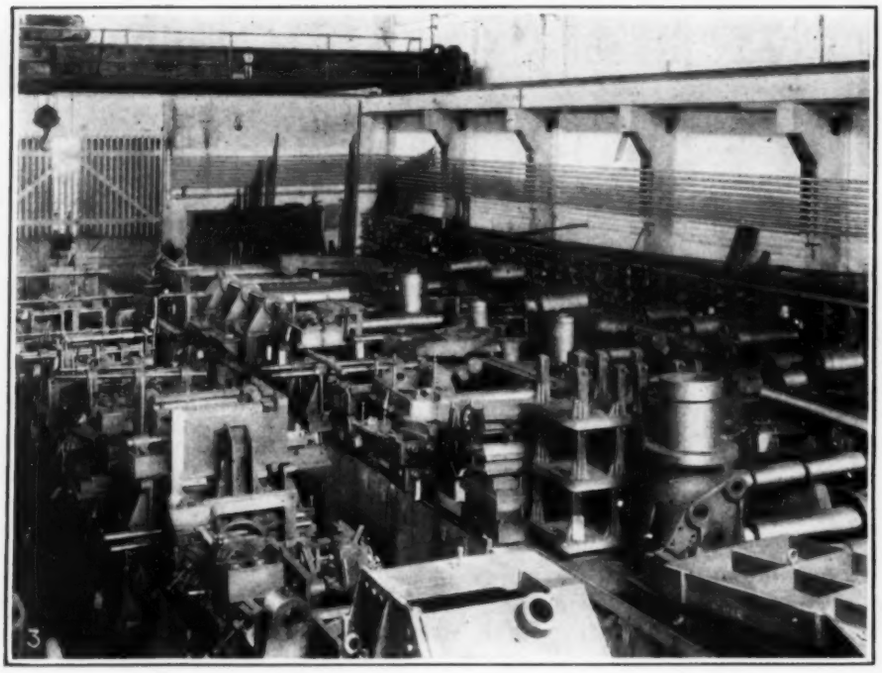


Fig. 1—The 30-ft. precision measuring machine. This machine is mounted on an I-beam supported on concrete columns. Arms are provided for supporting the work being measured, and there are also test bars at frequent intervals by which the machine can readily be set to check the accuracy of end-measuring rods. Fig. 2—The 80-in. measuring machine being used to check standard measuring bars. This view also shows the special inclosure built around the machine, as well as the large supply of standard snap-gages provided. All of these gages are checked for accuracy at regular intervals by means of the measuring machine



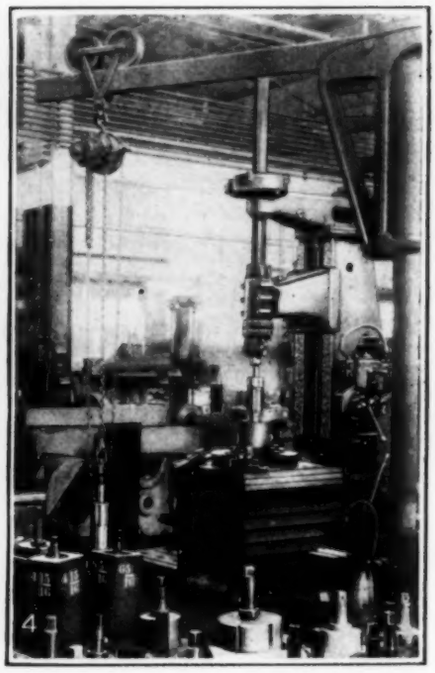


Fig. 3—Storage room for jigs, fixtures and tools. The bins at the side hold small tools and standard bushings where they are readily accessible. All of the heavier tools and fixtures have eyebolts, or holes into which eyebolts can be screwed, so that they can be easily handled by the 10-ton crane which transfers them to the regular shop cranes. Fig. 4—Special vertical reaming machine built to insure accuracy in reamed holes. The chuck is mounted on a three-piece work table that carries two rows of balls in each direction, so that the work can float under the action of the reamer. This view also shows how the reamers are protected when not in use, and the plain markings on the reamer boxes. Large reamers have holes in the ends for eyebolts to assist in handling

has been built in order to secure the accuracy desired. On this machine, holes from 3 to 12 in. in diameter and upwards are finished with reamers specially developed by the company. Bores are held to a tolerance of plus 0.0003 to minus 0.0002 in. To maintain such accuracy reamers are set to master limit snap-gages, one of the gages being kept for each size reamer in use. The dimensions of the limit snap-gages are held to size by Hoke gage blocks, and they are permanently set and are used solely for the specific purpose of checking one size of reamer. The use of gage blocks permits the most accurate method of commercial measurement that can possibly be obtained. The limit of error in the Hoke blocks is guaranteed not to exceed from five to ten millionths of an inch, depending on the size.

All reamers are of the inserted-blade type, and have pilots of suitable length and diameter. On the smaller sizes, up to 3 in. diameter, the pilots are 0.004 in. under size, and are from 1 to 1½ in. long. On the larger reamers, up to 12 in., the pilots are 0.007 in. under size and about 4 in. long. In order to ream a hole accurately, it is important not to allow too much stock for reaming. It has been found that the correct amount should be from 0.002 to 0.004 in., depending on the size of the hole. If more than this is allowed, the hole will be bell mouthed at the place the reamer enters. Also, the reamer is apt to cut oversize or to make the hole oval. With the pilots on reamers held to the sizes given, it is apparent that the holes must be bored large enough for the pilots to enter freely. This means that the holes should be bored about 0.002 in. larger than the pilots on the smaller diameters, and from 0.003 to 0.004 in. larger on the larger sizes. The use of pilots also offers an excellent final check on the boring of the holes. If the pilots do not enter, the work is sent back to be rebored.

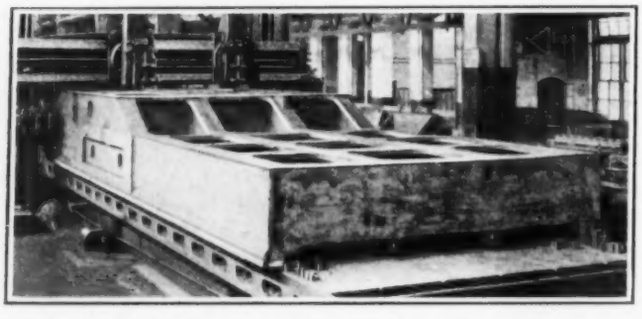


Fig. 6—Typical work being planed on a 10-ft. planer that has been widened to take in 12 ft. The four heads are all at work, and it will be noted that the thrust of the cutting tools is taken by a series of end stops instead of depending on a single stop

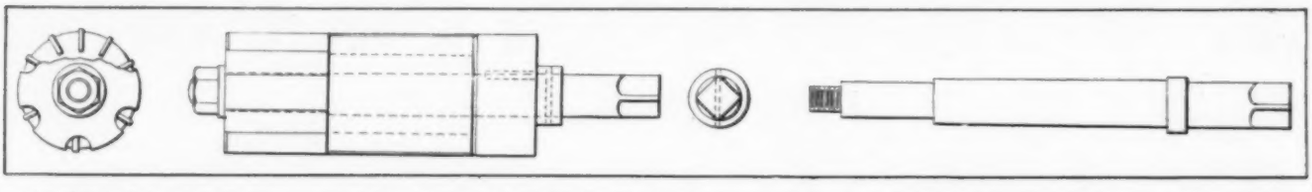


Fig. 5—Details of the reamer used in the machine in Fig. 4. Each reamer has a pilot that is free to revolve and is provided with large clearance spaces for chips. The reamer and the pilot are assembled on a central arbor

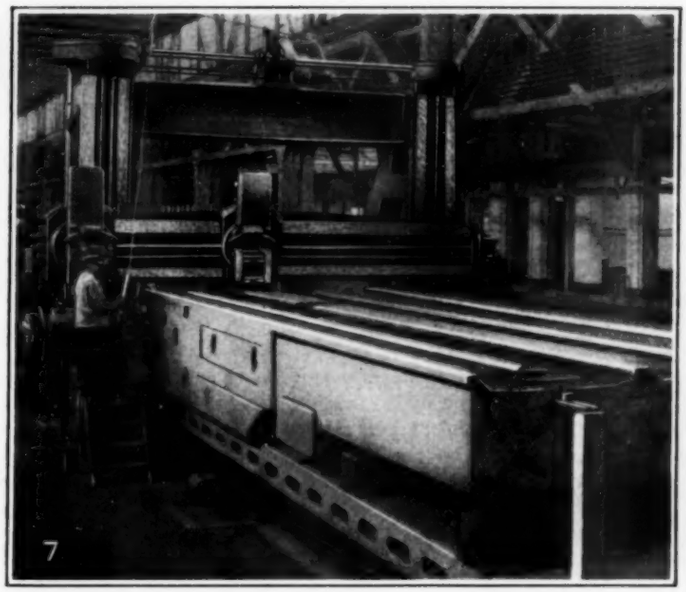


Fig. 7—Planing the other side of the casting. This is the same planer as shown in the previous illustration, but only one toolhead is at work. The depth of the bed casting planed can be estimated by comparing it with the height of the operator, who is standing on the fourth step of a ladder to enable him to watch the cut.

Fig. 8—Planing a pair of large housings at one setting. The housings are so clamped on the planer bed that the working faces of both of them can be planed at the same time, utilizing one side head and one of the heads on the cross-rail

The general construction of the reamers used is shown in Fig. 5. Several of these reamers can also be seen grouped around the reaming machine in Fig. 4, one of them being in position to ream bushings. In the larger reamers the ends of the driving shanks are drilled for eye-bolts to facilitate handling. Each reamer is housed in a square wooden box having the size plainly marked on the outside, as can be seen. It will also be noted that

Fig. 9—Checking alignment of the ways of a large planer. Hollow sleeves or rollers ground to standard diameter are placed in the V's on each side of the planer and have straight-edges placed on them as shown. The precision level used on a third straight-edge at right angles to the other two, checks the alignment at different points

the pilots are so mounted as to allow them to rotate on the shanks and that large grooves are provided in the pilots to allow plenty of chip room.

Reamers up to 4 in. are originally sized to plus 0.00025 in., and on sizes over 4 in. to plus 0.00075 in. All reamers are allowed to wear to the point where the go end of the plug gage will not enter the hole reamed. The go end of the plug gage is held to minus 0.0005 in., and the no-go to plus 0.001 in. The average mechanic will require the above amount on the go side of the plug in taking measurements. It is assumed that when the go end of the plug gage enters the hole fairly easily, but the no-go end does not, the hole is within the desired tolerance.

The reaming machine, Fig. 4 is of Niles special design, and has an adjustable chuck on a floating table. The table rolls on balls in both directions, to accurately center the work and to take care of any irregularity in the set-up. This machine has reamed holes up to 12 in. in diameter through spindles 4 to 6 ft. long, with a remarkable saving in time over any previous method. The actual reaming time on a hole 12 in. in diameter by 4 ft. long is about 20 min. This operation prevously consumed several hours. The table may be removed to give access to a pit where long shafts may be accommodated. This machine also handles the tapping of large bronze nuts for the lead screws of engine lathes and for elevating and feed screws of boring mills and

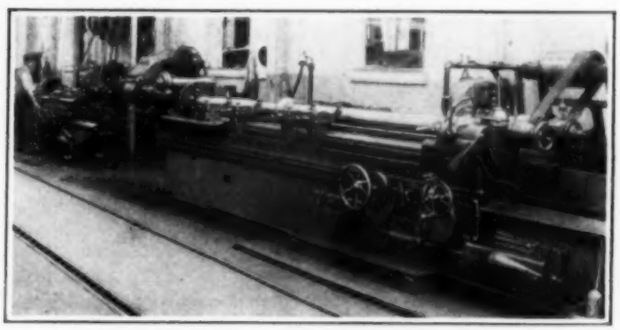


Fig. 10—One corner of the grinding department. Here all shafts and spindles are ground accurately to size, some of the grinding machines handling work up to 36 in. in diam., or larger if necessary. The use of grinders for finishing spindles has eliminated the old practice of fitting each spindle to its particular bearing

other large machines. Various standard leads can be obtained in the feed mechanism to suit the lead of the tap. Holes up to 4½ in. diameter are tapped with V, square, Acme, or special threads, according to requirements.

In the machine shop, great care is paid to the alignment of heavy machines that are used in evolving plain surfaces, such as planers, planer-type milling machines, etc. These machines produce the beds, tables, housings, cross-rails and similar parts of planers; engine-lathe beds; cross-rails and housings of boring mills; car-wheel and driving-wheel lathe beds; and similar heavy work. A heavy engine-lathe bed may, for example, be 50 ft. long and weigh upward of 50,000 lb. A large boring mill cross-rail is sometimes 56 ft. long and weighs 140,000 lb. Poor alignment in such machines will produce surfaces that are not true and flat, and impose excessive work on the fitters and scrapers who must correct such errors. Figs. 6, 7 and 8 show typical jobs on the bed of a large planer. All heavy machine tools are checked for alignment at regular periods.

The method of checking the accuracy of a large planer bed is shown in Fig. 9. Large sleeves or hollow rollers, of accurate diameter, are placed in the planer V's and are used to support two cast-iron straight-edges. A third straight-edge across the other two, and a precision level, show the condition of the alignment. By checking the bed at different points along its length, its condition can readily be determined.

As a further aid to maintaining close tolerances, practically all spindles and shafts are ground, even in diameters up to 36 in. and more, grinding machines having been installed to handle the heavest class of work. The engine lathe has been completely eliminated as a finishing machine, being used only for rough turning to grinding dimensions. Fig. 10 shows part of the grinding department.

Rebuilding Old Machinery

By K. T. George

ARTICLES on the rebuilding of machinery appear quite often, and the general opinion seems to be against it, yet there is hardly a concern of any size in the country that does not rebuild some of its machines. In fact, it seems to me that the larger factories should be able to do first class work along this line.

Among other things, I have charge of a machine repair or maintenance department, and I try to specialize my men on the upkeep and repair of certain machines. One man repairs and adjusts the milling machines; another, the automatics; a third, the turret lathes; a fourth, the radial drill presses, etc. By far, the greatest amount of work is simply adjusting clutches, spindle bearings, and similar small jobs. Through this sort of work, the men become expert in locating and eradicating trouble, and obtain a thorough knowledge of the machines and their weak points. Now, if machines would break down on a regular schedule of one at a time, it would be a very simple matter to keep every one working steadily, but machines do not act that way. There will be several down at once, requiring overtime, and there will be days with no break downs. Still, we must keep the repair gang on, and if there are no machines to be rebuilt and no repair parts to make, the men would have to be supplied with a club room and magazines. I know that they would enjoy it, but I fear the management would not.

When there is a lull, we make spare parts, overhaul and rebuild badly worn or worn out machinery, and, as the men are experts on certain types, they are capable of doing a good job of rebuilding.

A good feature is to have the bays of the building or buildings lettered and the sections numbered. Also, to educate the foremen of the various departments to give the name and number of the machine and the nature of the trouble, together with the location: such as, "D—17—Aurora Drill (setscrew broken)." This saves the foreman of the repair gang a lot of time in inspecting, and tells him the calibre of the mechanic to send out, and also, tells the mechanic, if he is a new one and unfamiliar with the plant, that the machine is located within a small area, and he can find it without help.

Going back to the rebuilding of machinery; a great many machines, even the new ones, break down from overloading. If the maker used alloy steel gears and shafts to a greater extent, I suppose his price would be much higher. Yet, we throw out cast-iron gears, cold-rolled or mild-steel shafts, soft worms, etc., substituting heat-treated parts in their places in order to force the machines to keep up to production requirements, and this on much up-to-date equipment.

There are certain machines that are out of date, and should be replaced. But punch presses that are not broken, drill presses and numerous other machines, generally speaking, not of the automatic type, can be rebuilt and years of good profitable service rendered.

Foot-Candles and Accuracy of Vision

By M. Luckiesh
National Lamp Works of General Electric Company

THE precision of work which is done under the guidance of vision cannot be greater than the accuracy of seeing. In the case of poor lighting—glaring sources, inadequate intensity, annoying shadows, etc.—it is not very difficult to convince the user of light that much improvement in seeing would result from a rehabilitation of the lighting system. However, in the case of a lighting system, which is fairly satisfactory in all respects excepting the foot-candles upon the work, it is interesting to know what improvement can be expected from increasing the intensity of illumination.

With this in mind we conducted an extensive investigation upon the effect of intensity of illumination upon the precision of working, maintaining all other conditions satisfactory and constant. The effect was measured by determining the accuracy with which a simple mechanical adjustment, guided by vision, could be made under several intensities of illumination. The results, referred to the precision at one foot-candle, are briefly:

Foot-candles	Increase in Precision
1	.....
5	8 per cent
10	11 per cent
20	14 per cent
100	16 per cent

The percentage increase in precision should depend upon the nature of the work and we believe we chose an average condition in this investigation. Our results are based upon 25,000 actual adjustments of the device by ten different workers.

The Lancia Floating Front-Wheel Suspension

By J. A. Lucas

THE front-wheel suspension of the Lancia car takes all the road shock and provides all the flexibility usually found between the front axle and the frame. Each front wheel has its own coil spring and a shock absorber that resembles the recoil mechanism, or recuperator, for which the French 75-mm. guns were famous. The construction of this mechanism is shown in Fig. 1 with the upper portion of the recoil chamber separated from the lower portion so as to show the coil spring inside and the recoil plunger inside the spring. When assembled, the lower end of chamber *A* goes through the upper knuckle forging and is held in position by the nut *B*. In this position chamber *A* fits over the portion *C* and completely incloses the coil spring and all the inner mechanism. The springs are wound from square rods of a steel made to Lancia specifications and drawn to the required size. They are wound singly, as in Fig. 2, the rod being supported on a rest that permits it to travel freely as the coil advances. Proper tension is applied to the rod by the clamp *A*, which is part of a carriage that travels at a predetermined rate along the bed so as to secure the desired lead for the spring. The mandrel on which the spring is wound is driven by the gears *B* through a clutch that is controlled either by the hand lever *C* or by the automatic knockout below it. The ends of the spring are close coiled, as shown at *D*, and are ground square with the axis, after which the springs are hardened in oil and drawn in an electric furnace. Details of this machine are shown in Fig.

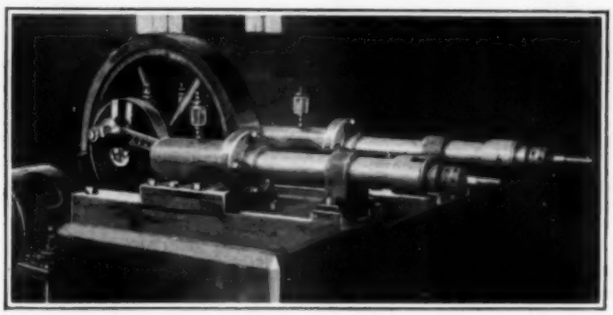
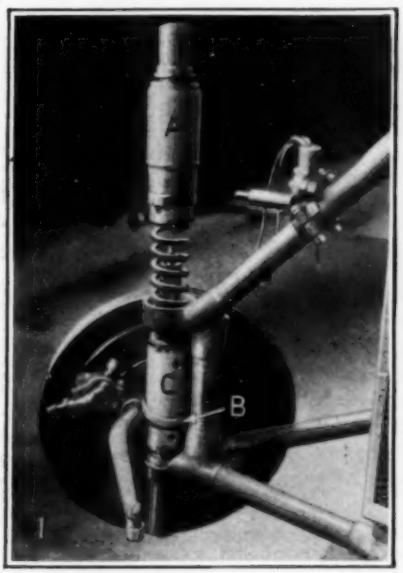


Fig. 4—Shock testing machine. A pair of springs is placed in this machine where a severe shock test is applied for a period of about 4 hr. This is the equivalent of between 40,000 and 50,000 miles of average driving



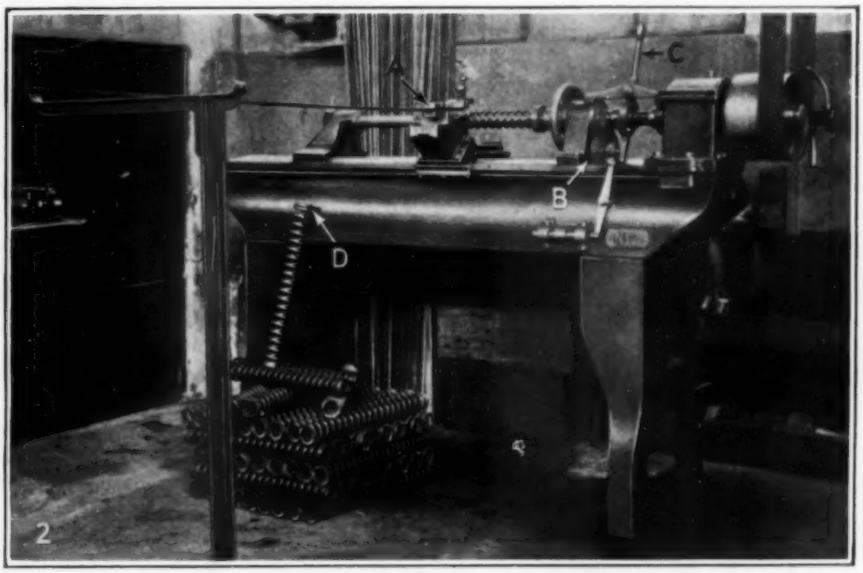
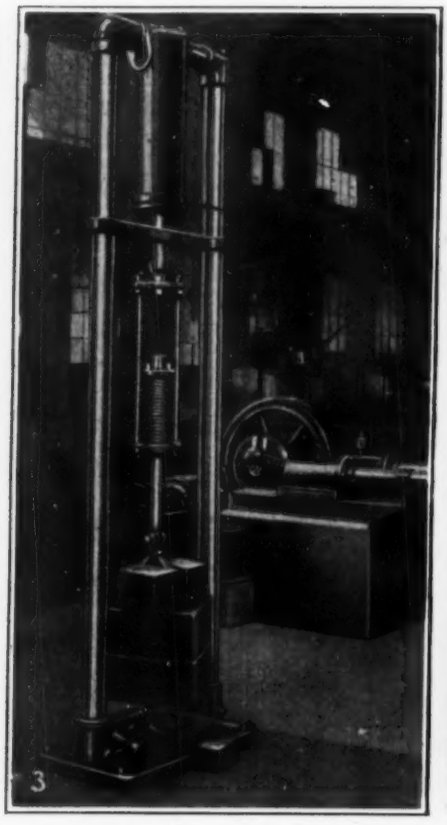


Fig. 1—Front wheel suspension, showing the coil spring used, the recoil chamber, the small plunger rod in the center, and the casing which covers them. It also shows the construction of the front brakes, and the way in which they are completely inclosed from dirt and moisture. Fig. 2—Coiling the spring. The coiling machine, how the rod is supported, and the mechanism by which the length of the spring is controlled



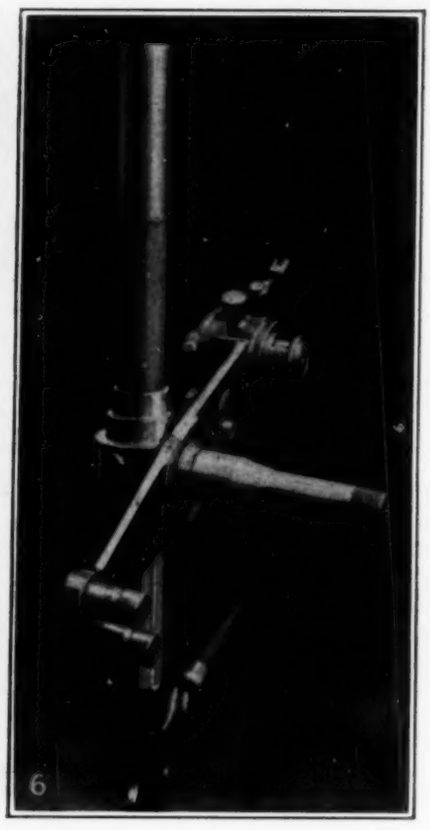


Fig. 3—Testing the spring under dead load. The predetermined load is placed below the spring, and is then lifted through the spring by means of an air cylinder at the top. Fig. 5—Testing the recoil mechanism. The tube and the plunger are ground and lapped. The test determines the accuracy of their fit, and the rate the oil passes through the valve. Fig. 6—Close view of the steering knuckle and the tube on which it is supported. The inside of the tube forms the recoil chamber, while the outside fits the yoke at the end of the front-wheel suspension

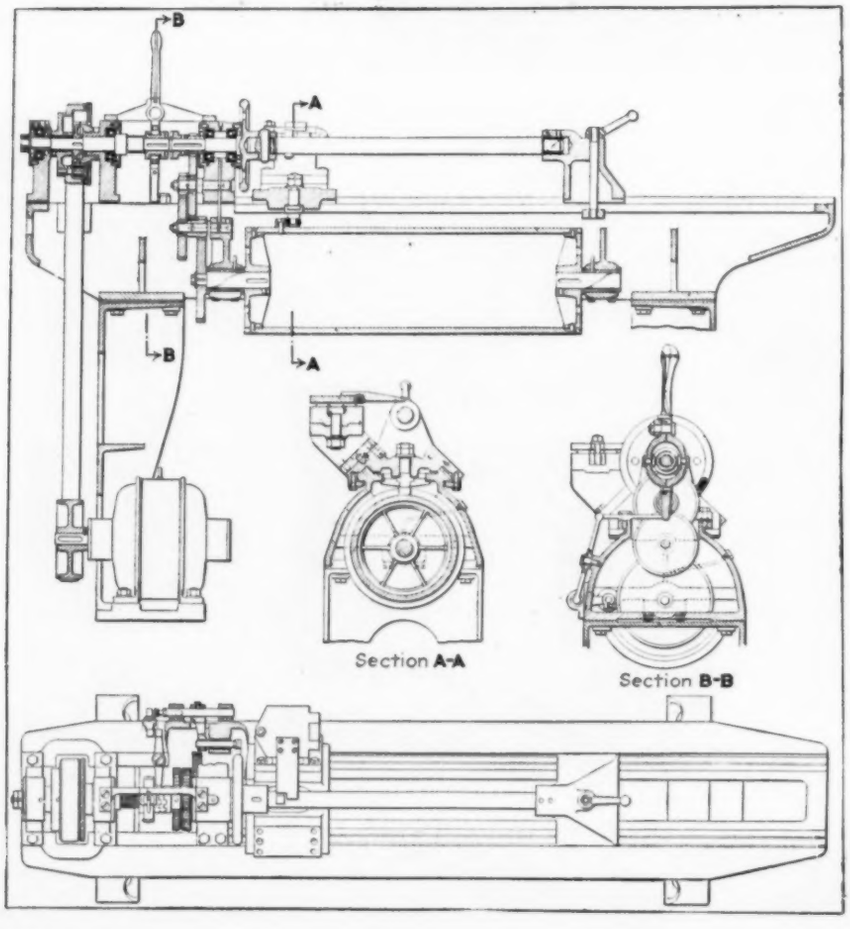


Fig. 7—Detailed and sectional views of the spring winding machine. This illustration shows how the mandrel is supported and driven, and also shows the gearing that connects the cam drum with the spindle

7. Next, the springs are tested in the compression machine shown in Fig. 3, to determine the load when compressed to a definite length. At a length of 9⅞ in., the average load is a trifle under 700 lb. The amount of load is determined only after the spring has been compressed a number of times. The dead load is raised by admitting air to the cylinder at the top, the spring under test being allowed to maintain this load for a given length of time before being measured.

Following the dead-load test the springs are placed in pairs in the machine shown in Fig. 4, where they are subjected to a severe shock test for something over four hours. The machine shown runs at 600 strokes per minute, and soon detects flaws or weakness in the springs being tested. About two per cent of the springs tested fail in this machine. This test is supposed to be equivalent to the average functioning of the springs for between 40,000 and 50,000 car-miles.

The piston mechanism, and the method of testing it, is shown in Fig. 5. Both the cylinder and the piston are accurately ground and lapped, and are, of course, provided with suitable valves through which the oil can flow from one compartment to another, as in all recoil mechanism of this general type. A larger view of the recoil tube, together with the steering knuckle and the support for the brake bands, is shown in Fig. 6. This illustration makes clear the method of attaching the steering knuckle to the tube, and shows that the brake-shoe support is an integral part of the steering-knuckle forging.

The spring winding machine, Fig. 7, was designed and built for this particular job. The driving mechanism is mounted on ball bearings and is motor driven through a vertical belt, a clutch controlling the driving of the mandrel. A clamp holds the end of the wire, or rod, and forces it to wind around the mandrel. The guide for the wire is close to the mandrel and is guided by a cam on the drum beneath, that forces it along at the proper rate to secure the desired pitch, or angle, on the spring. This cam drum is driven through the gearing shown between the end of the drum and the headstock. Two V-ways guide the feed carriage, or wire guide, the cam roller being in the center, as can be seen in the cross-section *A-A*. A machine of this kind can handle a variety of springs over a considerable range of sizes.

Browning the Barrels of Shot Guns

By William Densmore

THE smooth dark-brown—almost black—finish of the barrels of shot guns is generally the result of a process rather more complicated than would at first appear, and the men who do this work well and efficiently have acquired a degree of skill that comes only of long experience. It can also be done by the Parkerizing process, which is patented by the Parker Rust Proof Company.

When done in the general way, the barrels, as they approach the final stage of manufacture, have become highly polished; first being turned on special lathes, then drawfiled through several operations with files of increasing fineness, and finally rubbed with coarse- and fine-grained abrasive cloth, finishing with crocus. Though all of the work of polishing is done by hand, the barrels must not be touched with the fingers during the final stages, for wherever they have been so touched the spots will show up glaringly in the finished barrel, making it necessary to repolish them and start the process all over again.

From the moment of the last rub-down with crocus cloth the barrels are handled by means of wooden plugs driven lightly in each end of the bore. Most of the solutions are applied by hand with the plug in one end resting upon the work bench while the operator twirls the barrel by means of the plug in the opposite end as he plies the brush or sponge. In the few cases where they are to be immersed, the barrels are placed in racks designed to hold them separately and the wooden plugs are temporarily withdrawn.

The first treatment is to brush the barrels with a solution in which finely powdered whiting is suspended and to put them in an oven to dry. After a few minutes they are taken out, thickly encrusted with the whiting, and the dried powder is removed with bristle brushes. While still hot from the oven they are sponged with a special acid solution and placed in a steam room to "sweat."

Various acid solutions are used by different manufacturers. They are composed mainly of diluted sulphuric and muriatic acids, copperas, peroxide of iron and other ingredients, the nature and relative quantity of which is generally considered a shop secret.

After a time ranging from a few minutes to an hour or more in the steam room, the barrels will be covered with moisture, or "sweat," evenly distributed over the surface. The progress of the sweating is closely watched by the operator, and if it does not take place evenly it is stopped, the acid wiped off and the operation started over again.

A humid atmosphere in the steam room is essential, though the temperature is not too high to allow the operator to enter. The heat is applied by live steam circulating through coils of pipe, with provision made to blow steam openly into the room to produce the necessary degree of humidity. The amount of live steam admitted will be greater or less according to weather conditions; sometimes the sweating will take place satisfactorily without the addition of artificial means to produce the necessary moisture.

When removed from the steam room and the sweat allowed to dry upon them a stack of barrels resembles nothing so much as a lot of rusty junk. They are then placed in racks and immersed in boiling water for a time, after which they are scratch brushed with a soft wire wheel and polished on a rag or felt wheel. The entire process is repeated, often as many as five or six times, before the barrels are considered finished.

If a spotty or defective appearance develops upon a barrel at any time during the process it is taken out of the routine and returned to the shop to be repolished.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Training the Foremen in Management

"WHAT'S this new bunkum, Al, about a compulsory training course for foremen? The circular sounds a little wild to me. They must want to waste their money up there in the main office, hiring in a regular instructor from the outside to give us a course of ten lectures. And listen to the subjects: 'Departmental planning, the foreman and his wage problems, industrial good-will, service to customers!' Say, what's all that got to do with getting out production? It doesn't say it's compulsory, but they have put it across, just the same. It says 'every foreman is expected to arrange his work so as to be present in the apprentice school assembly room at the hour specified.'"

"Hold up, Ed, come up for air for a minute. I'm afraid you are at the old game of condemning before you have the facts straight. Personally, I think the course is going to be a knock-out, and I'm anxious to get started. My feeling is that the company is away ahead of the times in being progressive."

"Well, I can't see it, Al. Isn't it an awful waste to drag all of the foremen away from their departments for an hour every week?"

"Listen, now, Ed. Don't you remember that you objected to the super talking to the men? And you would probably object more if the higher executives took frequent trips through the shop explaining all the company problems to the men.

"The fact is, Williams showed me plainly where we stood on that. The company pays the men, furnishes the place to work, the equipment and the materials, yet the chances are that most of the men judge everything by the foremen they are working for. Their loyalty and interest mostly centers around the foreman, and it is the foreman who has to interpret company policies, and act as counselor and friend of the workman, as well as representing the management in the shop. The higher executives cannot find time to direct the men personally in a modern shop, so it's naturally up to the foremen to be the big cheese between management and men."

"So that's what the lectures are for, Al, to show us how to do it?"

"I presume so, Ed. The company knows we worked up from the shop, and have the production slant O.K. Now, it's spending the money and time to give us an idea of the bigger problems of control, so we can really represent the company in managing the men. That's the idea Williams gave me."

"Well, I hope you're right, Al, but I don't like this schoolroom business."

More than 300 companies held foremanship courses last year. How far should a company go in training its foremen? Does Ed describe the shop attitude, or do the majority of men accept it in Al's light? How much does the foreman represent the company to the men?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Should the Super Talk to the Men?

CERTAINLY the super should talk to the men, but discretion is necessary. In earlier days when industries and shops were smaller and the owner knew most of the men by name, and their family affairs, and when many of the men were accustomed to address him by his Christian name, such an action was an everyday occurrence. Today the super represents the owner and in this capacity it is surely fitting that he should be on speaking terms with at least the older employees. Such an action can create nothing but goodwill, and the foreman who resents it is not broadminded enough for his job. Again, if the super is passing, no harm can be done by a few simple questions on the spot, whether to an old employee or not. The man who is foolish enough to take such an opportunity to let his foreman down, or himself either, will naturally reap the reward of his foolishness. The super who is foolish enough to thus acquire information which he later uses to confound his foreman or other official will also reap his reward in the form of disloyalty. He should accept his foreman's assurances and explanations of shop matters or he should not continue to employ him. At the same time it should be remembered that some people are very apt to appropriate all credit for their subordinates. That the super occasionally makes personal contact with the men helps definitely to check this tendency and enables him also to evaluate those in the ranks who may be possibly selected later for promotion. —P. HYLOTT, *Scotland.*

Too Many Safety Signs

IS IT necessary to paper the walls of a shop with signs to promote safety? Does a man lose his finger in a press or get caught in a belt because there was nothing to advise him of the danger incurred by leaving the guards off? Common sense can prevent more accidents than a gallery of pictures showing slipping wrenches, men falling from ladders, and other portraits of individuals suffering from carelessness. The man who does not know that certain actions will produce physical discomfort to himself or to others, is certainly lacking in common sense and is far beyond learning from a painted picture.

An actual occurrence may be more convincing. In our shop, leaving the guard off a press is a serious offense and carries a penalty of immediate discharge. A placard in the press room visualizes the possible result of this neglect. Sometimes, the absence of the guard enhances production. One of our press hands, knowing this, tried to increase his daily output. He lost two fingers, and several weeks of work. His department was held up for one hour. The morale of the entire plant was affected and the usual criticism followed. Sympathy was the only reason for retaining this man as an employee. The poster did no good; the threats of discharge did no good. It was entirely a matter of poor judgment. —R. E. PETERSON.

IT SEEMS to me that it is illogical to think that safety work cannot be overdone, as well as anything else. Safety should ever be kept before us, and ever to the front. But a safety sign displayed at every point that affords a prominent position, soon becomes commonplace and does not get the amount of attention that it would if displayed at points of real danger only. Where there are several machines that are alike and it seems best to place a warning notice at each machine, the best results will be obtained by having each of the notices differing as much as possible in general appearance and placed in different positions at the machines.

The same principle applies to safety meetings. Very formal and regular meetings fall far short in results compared with those that are held only when there is something new to be presented. —JOHN MARK MAY.

Paternalism or Privacy?

WHEN an employer gives his workers good air, good light, safe and comfortable working conditions, and encourages athletics and recreational activities, he is justified in other ways than paternalism or philanthropy. Better health and a better attitude as a result of these activities produce the largest output with the least cost.

The family life of a worker is generally a difficult spot to be approached by an employer. No workman wants his employer to interfere with his home life and habits. However, any workman will appreciate better home surroundings, such as well paved streets, shade trees, or electric lights in those parts of the city occupied by the workmen. Often manufacturers are willing to spend money to elect men to office who are pledged to grant them special privileges, but do not use these influences

THE·NEXT·TOPIC

Helping Tony Celebrate

ADVANCE QUESTION

Al helps his Italian workmen celebrate a natal holiday. Ed thinks he should tell them to "forget it." Al thinks it helps to hold goodwill. What do you think?

to secure betterment of home surroundings for the employees. No personnel department that attempts a welfare service for the workmen is a success unless it keeps in sight the promotion of contentment and stability in the working force. —HAROLD W. HANSON.

Is the Kicker Always a Nuisance?

THE chief point of usefulness that emerges from the controversy is this: the workman is displaying qualities which, in themselves, are excellent, namely, tenacity and determination. He is not made of that stuff which is easily beaten, thwarted, or gives in. He wants to make the best of his work in his surroundings. The foreman should recognize this, for while he fails to realize the man's sense of injustice and that production is hindered thereby, he will not see the wisdom of utilizing the good qualities the workman is exhibiting. Such qualities he could turn into a useful channel and thus make the workman a valuable asset in the shop. When he does appreciate this, he will feel more inclined to exercise a spirit of tolerance and let the operator see that he means to deal fairly with him. —J. W. PEPPERDINE, *England*.

Extra Pay for Extra Effort

IF THERE is only a single operator in a plant working on a given operation and he discovers a short cut, the fairest proposition would be to maintain his piece rate, so that he gets full value for his initiative. The management, of course, gets the benefit of increased production on the same machine investment and overhead charges.

However, if the operator is one of a group all working on the same operation, there is no real moral reason why the others should particularly profit by his initiative. In this case the piece rate may be cut, perhaps not all the way, but at least to the point where the major portion of the direct saving goes to the management. The piece worker responsible, however, should receive a considerable bonus—either in a flat immediate payment or a percentage of the saving of all for a definite period of time. To substantially recognize the thinking individual is essential, otherwise all initiative will be forever destroyed, not only on his part, but for all piece workers. Given a proper and fitting reward, his example cannot but help act as an incentive for all the others to each try to find an improved and easier way.

—P. H. HOELZLE.

Giving Men Credit for Good Work

GIVING men credit for good work is a good idea, but the way to do it is the important thing. The bulletin is not the best way, especially for some men who, the minute their names appeared on the bulletin board, would get "swelled heads." A friendly comment from a foreman or manager is quite all right, and will give encouragement to further effort.

Some men think more of a word of praise at the right time than an increase in pay, while others will not even think the increase sufficient for the work done. As an example, I gave a man an increase in his wages without being asked, because he was doing good work. To make sure that he got it, I asked him, and received the reply that I put the raise in only because I knew he was worth more than he was getting. I did not do the same thing for him again. —H. MAPLETHORPE.

Shall It Be Layoffs or Short Time?

THE question of asking the men to decide whether there should be short hours or a partial layoff is largely governed by local conditions, that is, the type of labor affected. If skilled, it might be desirable to put the question to them for settlement. If largely unskilled, the turnover is so great that it would hardly be fair to the older men to expect them to accept the decision of the large majority of newer men.

The size of the plant would also govern the method used. If comparatively small, it would be a display of confidence, not soon forgotten by the men, if they should have this question put up to them.

The writer has made contacts with all classes of labor during a period of either layoffs or short hours and has found practically everyone in favor of short hours for all, as against the layoff of a few. Most of the employers used short hours as a means of reducing output, but without consulting the workers affected.

—O. W. SCHRICKER.

WHAT harm would befall the shop if the men had the say in questions of this nature? Assuming that all the undesirables have been slowly removed when the work began to get slack, the management is now faced with the layoff and probable permanent loss of a number of good and faithful employees or a reduction in the hours of work. But how much different will the men feel if they are brought face to face with such a problem and see their decision put to the test? And you may be sure that snap judgment will not enter. The layoff will be talked of at home as well as in the shop, and if the management is above board in presenting the true facts, there will be as contented a force of men as possible under the circumstances. All of us like to have something to say about our conditions of existence, and when it does not cost anything to satisfy us, why not do it?

—B. E. R. RENAUD.

Discovering Hidden Ability in the Men

PUTTING a man in a responsible position, unless he has plainly showed that he has the ability to handle it, is doing a decided wrong both to employer and employee as it is almost a hundred to one shot that he will not fill the bill. By so doing, you would be jeopardizing your business to an extent, and also making a dissatisfied employee out of a man who, no doubt, was an asset to the organization in the position he occupied before his undeserved promotion.

I have found that if a man has the ability and the courage to tackle a bigger job, these qualifications will soon be discovered by his superiors in the organization. If, however, for some reason he cannot find an outlet for his potential powers where he is now employed he will soon quit, and the company will lose by it.

—C. L. ANDERSON.

Portable Woodworking Machines by Mass Production

By R. J. Reiser
Superintendent, J. D. Wallace & Company

Gears designed to be run at very high speeds without appreciable noise—An instrument for testing the concentricity of pitch circles of spur gears, both plain and helical

WHERE two or more holes are to be drilled and tapped, a multiple-spindle drill equipped with a tapping attachment is employed. Fig. 8 illustrates drilling and tapping a motor-end flange. Special attention is called to the type of drill jig, which is octagon in shape. Guide bushings are located in all of the eight sides or faces of the jig, thus enabling every hole in the flange to be drilled before removing the work from the jig.

The crosscut fence of the machine is pivoted on the end of an arm with slides on the frame rail. The machining of the pivoting end is performed on a 20-in. single-spindle drill. The crosscut fence-arms are of right- and left-hand design, the portion receiving the fence proper being machined to 2.245 ± 0.002 in. diameter, drilled and tapped for a clamp screw and faced to a definite height. Two tools are used, one for roughing and one for finishing. These tools are of the trepanning type with pilots, and are driven in a quick-change chuck held in the drill spindle. The roughing toolbit is held in a movable block that is adjustable to compensate for wear and grinding. The facing toolbit is held in the main body of the tool and is adjustable up and down for facing to the proper height. The finishing tool is the same as the roughing tool, with the exception of an additional toolbit inserted in the body for chamfering the corner of the 2.245-in. diameter. While this operation is properly a turret-lathe job, a lathe of 24-in. swing would be required and a machine so large would be cumbersome to handle on such light work. A drill press equipped with a fixture and the tools described above performs the work very effectively.

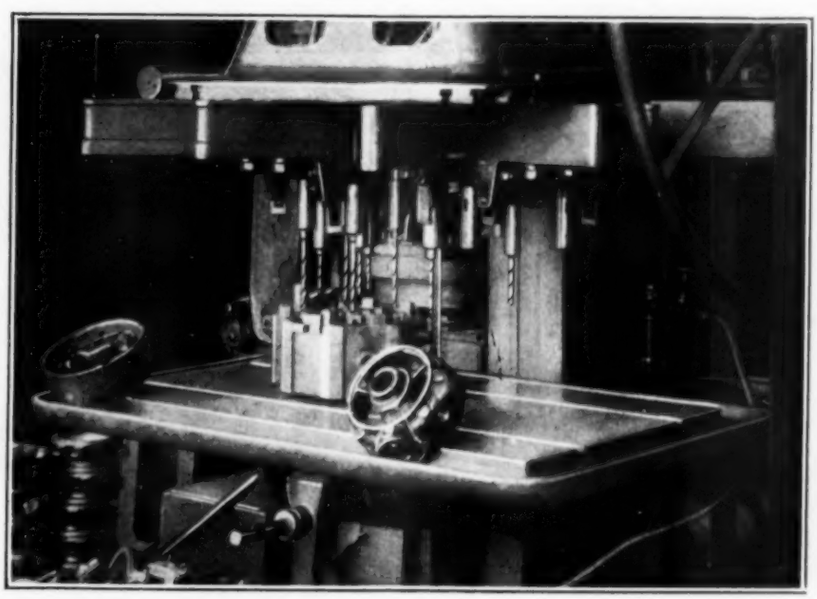


Fig. 8—Drilling and tapping the holes in a motor-end flange. The jig is octagon in shape and the drill bushings are located in all of the eight surfaces. By this arrangement, all of the holes can be drilled in the flange without the necessity of removing the work from the jig

The application of gears for transmitting power in woodworking machinery is recognized as a problem of no mean magnitude. Quiet operation at extremely high speed is obtained only by careful attention to every detail of production. Unimportant as it may seem, the design and machining of the gear blank is paramount in producing accurate gears for a successful gear drive. Moreover, accuracy in the gears themselves is only one of the necessary conditions; the gear case, shafts, bearings, and lubrication, are all contributory to the success or failure of the drive.

Power is transmitted to the saw blade through a pair of helical gears. A 10-pitch, 60-tooth, cast-iron gear on the motor, rotating at 1,800 r.p.m., drives a 21-tooth, bakelite pinion at 5,200 r.p.m. The gear is of the hub, arm, and rim design shown, with dimensions and limits as given in Fig. 9. Incorrect design and association of these three elements would result in failure. Internal strains are inherent in all castings, due to uneven cooling of the casting in the mold, and here is where correct design plays its important part. Exhaustive tests as to shapes and material were conducted in our own shops, developing the design chosen and the methods of machining. First, the shape of the blank was given careful consideration and cross-section areas of the rim, arms and hub were made as nearly uniform as possible. The arms are flat and S-shaped in the direction of the axis of the hub and are uneven in number, thus leaving a space opposite each arm. It

Conclusion of the article.

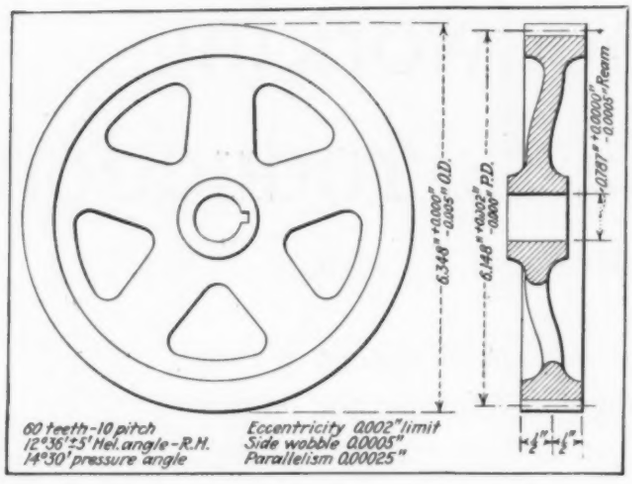


Fig. 9—The driving gear. Exhaustive tests were made to develop a gear that would be the least affected by cooling strains and that would be the least distorted in operation. The arms are flat and S-shaped in the direction of the hub axis and are uneven in number

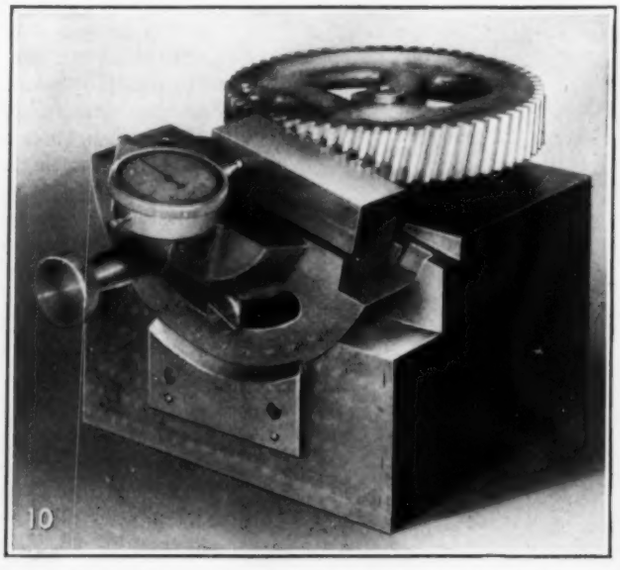
is obvious that a gear blank of this design will have a minimum cooling strain and distortion in operation. The sequence of machining operations is as follows: (1) Rough face, bore and ream, (2) rough face other side, (3) broach keyway, (4) rough turn O.D., (5) finish turn O.D. and face sides, (6) cut teeth, (7) inspect.

We consider the operation of cutting the teeth of *secondary* importance in producing accurate gears, as it is a well-known fact that gear-cutting equipment has been developed to a high degree of perfection. Our attention is centered on the preparation of the blank, particularly on the finish-machining operations. Parallelism of the faces is held to 0.00025 in. Side wabble, when the blank is mounted on an arbor, must not be greater than 0.0005 in., and eccentricity of the outside diameter must be within 0.005 in. The operations are performed on a lathe, from which the blanks are immediately transferred to the hobbing machine.

The proper inspection of gears has been difficult and involved, because the pitch diameter (the most important practical dimension) is in imaginary line, and therefore cannot be measured directly. To facilitate inspection of our gears we designed and built the instrument shown in Fig. 10, for determining whether or not the pitch diameter, eccentricity, and helix angle are within the specified limits. These three elements are read directly on a dial indicator and a vernier scale, both of which are a part of the instrument. The use of master gears in this device is not required, as in some gear inspecting devices. The gear to be tested is mated with a rack made of steel, hardened and ground. As the sides of theoretically-perfect rack teeth are straight lines, they can be measured accurately with simple measuring instruments, attaining a high degree of perfection practically unknown in master gears. The stud on which the gear is mounted is fixed in an adjustable slide on the base. The indicator is stationary on the swivel head holding the testing rack. The swivel head is mounted to rotate 45 deg. to either side of the horizontal position. A vernier scale facilitates readings to $\frac{1}{12}$ deg., making possible the inspection of gears from a straight spur to a 45-deg. helical gear.

The dial indicator is set to read zero by means of an end-measuring block that is placed on the stud before the gears are inspected. It is evident that if the gear held in mesh with the rack has perfect teeth, the indicator will register zero, and any variation from zero will indicate the amount the pitch radius of the gear is over or under size. To check for eccentricity, the gear is revolved until the rack passes out of mesh with the teeth, then re-inserted successively until a complete revolution has been made, the variation of dial readings being the amount of eccentricity of the pitch circle. The inspection gage is placed beside the gear hobbing machine and each gear is checked immediately after the teeth have been cut, being stamped to show the amount of eccentricity.

The bad effects of vibration are too well known for a lengthy discussion here. Injurious in all rotating machines, it must positively be eliminated in high-speed



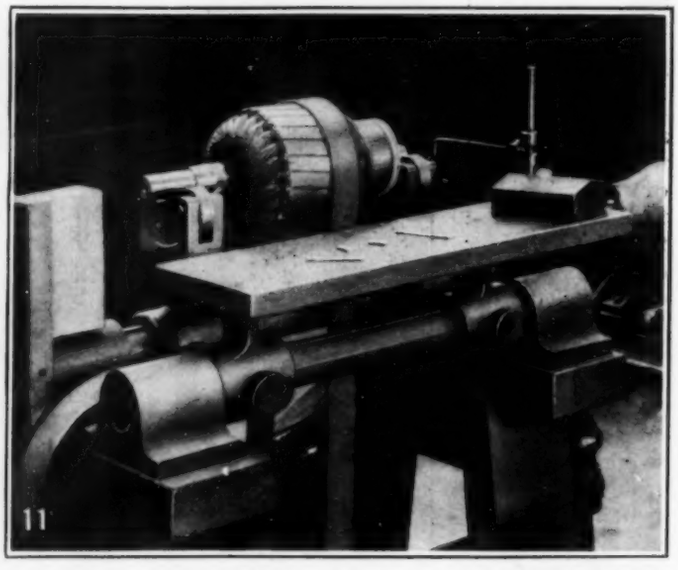


Fig. 10—An instrument for determining the correctness of the pitch diameter and the helix angle. The readings are taken from the dial indicator and a vernier scale, both of which are a part of the instrument. The use of a master gear is not necessary. Fig. 11—Balancing an armature dynamically. The armature is run at 1,725 r.p.m. and is supported at each end in blocks having slightly-curved lower surfaces so that it will oscillate if out of balance. Correction is made by inserting strip brass in the armature slots to act as counterbalance weights

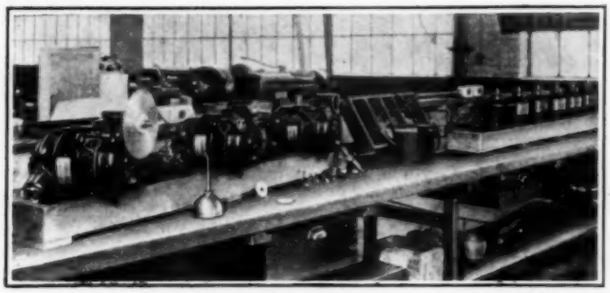


Fig. 12—A work station in the assembly department where the drive units are assembled. This sub-assembly, consisting of the motor and its connections, can be easily and quickly attached to the other units making up the complete machine

machines. The armature and driving gear rotate at 1,725 r.p.m. which makes special measures necessary to balance these parts sufficiently to reduce vibration to a minimum. We accomplish this by the dynamic method as shown in Fig. 11, where the balancing machine is set up for balancing an armature. The armature rests at each end on ball-bearing rollers that are mounted in blocks, or holders, having a slightly-convex lower surface, and these blocks in turn rest upon flat-surfaced pedestals. The armature is rotated at its normal speed of 1,725 r.p.m. by means of a belt from a motor in the base of the machine, and obviously will oscillate freely if out of balance. The unbalance is located by touching the shaft at each end with a stylus held in a suitable base, the shaft having been coated with lamp black to make the marks visible. The marks will show part way around the shaft only, thus indicating the unbalance. Correction is made by inserting strip-brass weights in the armature slots. The gears are balanced separately in the same manner, with the exception that to correct unbalance the weight is removed by drilling holes in the rim. This balancing operation, together with the microscopic care in finishing the gears, makes possible the use of a gear drive for a saw spindle speed of 5,200 r.p.m., a rate that is generally considered impossible. Moreover, this speed is maintained with absolute silence, and without measurable wear of the gear teeth.

The manufacturing scheme is carried out in our assembling departments as well as in our machine departments. Standardization of methods, and specification and division of labor in these departments can be obtained to the fullest extent only when the unit or sub-assembly method of production is employed. That is, parts forming logical units are assembled and then treated as individual parts in the line of production. In Fig. 12 is shown a work station in the assembly department where the drive units are assembled. This sub-assembly includes the motor, switch, cord, and plug, in such form that it can be easily and quickly attached to the other units making up the finished machine.

The department for final assembly and testing, or inspection, of finished machines covers a floor space 22x54 ft. only and is shown in Fig. 13. The equipment and layout is unique in its arrangement for obtaining flexibility in handling a small or large volume of work. A continuous monorail track is laid around the floor space, forming a long U-shape, the open end terminating at the shipping room door. Dolly trucks 24 in. wide by 36 in. long by 6 in. high, equipped with roller-bearing wheels, serve as conveyors on which the machines are assembled and conveyed along the track up to and past the inspection and test stations, thence to the shipping department. Specially-designed trucks for transporting the required amount of parts from the stockroom, have shelves and compartments so arranged that the assemblers can remove any part without interference from the remaining material. Workmen are stationed along the track at the right of the inspection station, the floor space between the tracks being reserved for material space. The number of men is limited by the length of the track. As has been stated earlier in this article, various types of machines are manufactured and the assembling is done in accordance with a production schedule. Usually, all assemblers work on one type of machine until the lot is completed, but the production system admits of any variation, so that if necessary machines of all types may be assembled at the same time.

Inspecting and testing finished machines cannot be complete unless the proper and complete apparatus is available. In Fig. 14 is shown a power distributing panel fed by a rotary converter and a rotary frequency changer. The panel is equipped with necessary transformers, instruments, switches, and receptacles. At the various switch settings from 32 to 250 volts, d.c. can be obtained. The same voltage in a.c. current from 25 to 60 cycles is available. The wiring is so arranged that machines equipped with motors of every known current rating can be run simultaneously. As the assemblers complete a machine, they move the conveyor toward the inspector's stand and then continue their work with the next assembly. When the machines reach the power-distributing panel, the motor is plugged into a receptacle of the proper rating and given a 1½-hr. run. This is a breaking-in period both for the motor and the mechanical working parts of the machine. After the running test, a general inspection of the mechanical construction is made, and cuts at various angles are taken to show whether or not the established accuracy has been maintained. For inspection of the electrical operation of the motor, voltmeters, ammeters and wattmeters are used. The readings of these instruments must agree with the standard set for operation of the various types of motors with which the machines are equipped. All these records are set forth on an inspection form and are filed for future reference, if necessary.

The machines are now ready for crating and shipment. Here again manufacturing production methods are employed. Crates have been standardized and specification sheets are supplied to the workman showing the

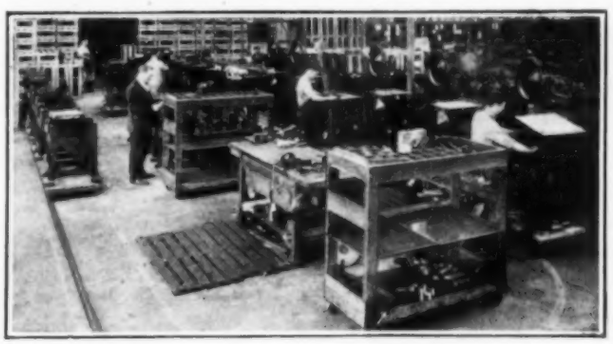


Fig. 13—Department for final assembly and testing the finished machines. The equipment and layout provide great flexibility for handling work in either large or small volume. A continuous monorail-track is laid around the floor space, the open end terminating at the shipping room

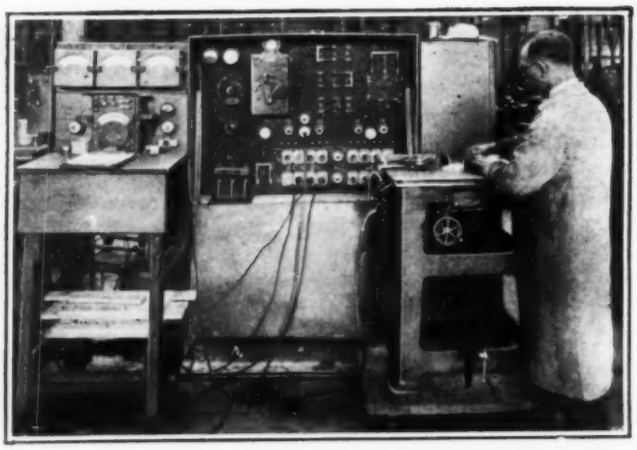


Fig. 14—The power distributing panel is equipped with the necessary transformers, instruments, switches and receptacles. Direct current can be obtained in from 32 to 250 volts. The same voltage is available in alternating current in from 25 to 60 cycles

size and number of pieces of lumber required for each crate. Lumber for a quantity of crates (usually 25) is cut in one setting. Next the crates are partly assembled; that is, the skids or bottoms, sides, ends, and tops, are each nailed together and stacked until needed, the operation of the actual crating being greatly facilitated by this procedure. The machine is placed on the skid and fastened down; then the sides, ends, and top are nailed to the skid, thus making a very simple operation of crating.

By the same methods illustrated in the foregoing description, all constituent parts of machines are manufactured and assembled. Although originally designed with careful attention to every detail, the machines are watched in service, and improvements are made whenever undue breakage or wear of any part suggests a change. Machining limits likewise are continually revised to make the closer fits that will give shorter assembly time and longer life. New materials appearing on the market are utilized whenever an improvement can be effected by their use. Factory methods are never considered final, new equipment and fixtures being provided whenever they offer a saving in production time and a reduction in spoiled parts. Each job is given to the same man whenever possible, and by years of experience he becomes adept and rapid to an astonishing degree, increasing his earning power and producing better parts all the time.

The sum total of these processes is *quality*, and quality applied to any machine means maximum durability and output, with minimum operating expense and maintenance.

Who Pays the Cost of Price Cutting?

All sorts of comments on the articles dealing with price cutting are coming in, which is proof enough that the subject is a live one. Last week Mr. Whitehorne's second article appeared. This week there is a constructive discussion by E. F. DuBrul. The third Whitehorne article is in process.

SEEN · AND · HEARD

By John R. Godfrey

Coolant for cast iron—Standards for shop practice

A FRIEND of mine who runs a big shop in the middle-west showed me a general specification sheet for new machines, the other day, that was interesting in several ways. To begin with it showed changes in shop practice that were illuminating. The sheet demanded oil pans on all machines because considerable coolant is used in turning and boring cast iron. That would have been heresy twenty-five years ago. It also gave preference to machines equipped with roller bearings on the main spindle—and we *knew* they could not be used for the purpose, twenty years ago.

New machines were required to work within 60 per cent of the tolerance range, so as to allow for greater variation when worn from use.

Standard bushings were demanded in all drilling fixtures. The type of drill chucks was also specified, and no proposals were desired from concerns that did not use heat-treated gears in all vital gear trains. It required that all machines must be fully guarded in every way possible to prevent accidents.

Balance wheels were asked for wherever possible on all machines. They could be either mounted on the spindle or geared to it. While flywheels are used on the spindles of many gear cutting machines, I've never seen them specified on machines in such a general way before. Perhaps we've been overlooking a bet somewhere along the line.

A duplicate set of tools was also required, whenever they were special in any way. This shop also has standards for certain reamers, certain cutting steels for turning and boring and certain alloys for milling cutters. It is one of the best examples of shop standardization that I've seen.

Some buyers try to specify every last detail of a machine, even to the size of the bearings. In this case such details were left to the builders of the machines, only demanding such general items as the type of bearings, the kind of motor and such types of tools and tool holding devices as would fit in with their previous equipment. They naturally wanted to be able to use the type of tools in all departments.

It is the cases like this that standard spindle noses help a lot. The milling machine builders did a big thing for the industry when they took the bull by the horns and adopted a standard. It has helped both builders and users and it's also an excellent object lesson in what can be done along that line. I'm told that not a single customer has asked for one of the old spindles since the new one was adopted.

There is more of this plant standardization going on about the country than many realize, and when well directed it makes for both simplification and efficiency. It helps to cut out many of the little expenses, small in themselves, that go into the grand total of that bugaboo we call overhead. Carrying duplicate tools for different machines because they were equipped with different types of chucks or other tool holding devices, adds to the cost of doing business.

Who Pays the Cost of Price Cutting?—*Discussion*

By E. F. DuBrul
General Manager, National Machine Tool Builders' Association

THE article on page 329, Vol. 68, of the *American Machinist* is a valuable contribution to the literature dealing with policies of executives of big and little businesses. Toward the end Mr. Whitehorne brings out three constructive suggestions.

The first is that secrecy of bids should be eliminated. As an ethical thing a buyer should not disclose one bidder's price to another bidder. But, as an ethical thing, the buyer should not lie about the bids he has received. Therefore when the buyer starts to haggle about a price, and makes a statement that he has a bid lower than that submitted by a given bidder and asks the second bidder to reduce his bid, the bidder should be given plain evidence of the existence of the lower bid. But why should not business abandon this whole jockeying policy? If business is to be conducted by competitive bids, there should be public opening and publication of all bids as in the case of Government business. Also, as in the Government's case, there should be no revision of bids after they are opened. Sellers should do all their price cutting in their bid and not after the bid is in. The above method would apply to transactions involving goods that are not sold on a regularly issued price-list. For standard goods regularly price-listed by the manufacturers, the price-list itself should always tell "the truth, the whole truth and nothing but the truth." If the list price is not the actual price but is subject to discounts, then these discounts should be as openly stated as is the listed price. This is not only fair and open business practice, but it is the only practice that conforms to the finding of the analytical economist. Competition is an effective factor in price making only when the actual price is available to all competing sellers and of course to all competing buyers. Economic competition must be based on the fullest possible information being made available to both sides of a transaction. True economic competition is also true fair competition. And, conversely, truly fair competition is the only economic competition. The unfair competitor gives the most potent argument the socialist can get hold of.

When price-lists mean just exactly what they say, without reservations, amendments or deviations, the price-list itself, and the open discount sheet that may have to accompany it in some cases, will correspond to the bids that may be submitted where bidding is in vogue.

The equipment industries, whose products can be listed on open price-lists, will not be healthy until they see the wisdom, as well as the fairness, of what the Machine Tool Industry designates as the "List Price—One Price—Firm Price" policy. The "Firm Price" policy consists in making no deviations from the price quoted, whether that price is on a published list for standard articles or whether it is a price of a special job. The "List Price" policy means to have the list and any necessary discount sheets tell the full and exact truth. The "One Price" policy means to make the same price and terms to all customers at the same time without any discrimination between customers. These three terms merely describe different facets of the same jewel of consistency and fairness. Their general adoption by the equipment industries would do more than any other single thing to put a stop to the "Profitless Prosperity" that is now entirely too prevalent in the machinery industries. Mr. Whitehorne's third recommendation necessarily implies the organization of competitors so that they may have a definite method for holding the post-mortems recommended. To be effective, such post-mortems must develop the actual facts of closed transactions. All competitors would then know just what their competition actually was. This knowledge is of tremendous value. Every trade association executive can cite case after case showing how such post-mortems have turned up buyers' statements that were either outrageous lies, or were skillfully misleading innuendoes, which an unskilled salesman accepted as truth.

A true post-mortem shows just how the deal was finally worked. If it was on the level, well and good. If it was not on the level as far as the buyer was concerned, then all the competitors participating in the post-mortem

The constructive policy for the equipment industries to follow is:

1. Establish the "List-price, One-price, Firm-price" policy

2. Hold post mortems on competitive bids as standard practice

3. Organize a Trade Practice Conference to lay down the combined wisdom and experience of these industries as their Law Merchant

4. Under the Clayton Law, prosecute the few persistent offenders that may later violate this Law Merchant

know that no confidence can be placed in that buyer's next statements. If the post-mortem discloses weakness on the part of the seller, he himself learns wherein his policy was weak. If he does not strengthen it on the next deal, his competitors then know what kind of competition they have to meet because of his weak policies or unskillful salesmanship.

I would add one further suggestion to Mr. Whitehorne's, one that will hasten the clean-up of buying and selling practice. Mere resolutions and codes of ethics do not work fast enough. My suggestion, if adopted, will speed the day of better practice. It is that all equipment industries join in a request to the Federal Trade Commission to organize a Trade Practices Conference which would formulate a "Law Merchant" for the equipment industries, designed to correct any evils that exist on both the buying and selling sides.

If these industries undertake their own self-government in this fashion, the vast majority of these practices will disappear. They will vanish, not by mere resolution, but because the legal power of the Federal Trade Commission itself will be behind this Law Merchant, and because the Commission will undertake the prosecution of violators under the Clayton Law forbidding unfair competition. The Commission uses such Law Merchant as its guide as to the industry's own definition of what constitutes unfair practices. When the Commission has the recorded, accepted, general opinion of an industry to guide it, under the law the Commission can and does make it extremely unpleasant for either the slick buyer or the slick seller who wants to break the rules and take unfair advantages.

To sum up, therefore, I should say that the constructive policy for the equipment industries to follow is:

1. Establish the "List-price, One-price, Firm-price" policy.
2. Hold post mortems on competitive bids as standard practice.
3. Organize a Trade Practice Conference to lay down the combined wisdom and experience of these industries as their Law Merchant.
4. Under the Clayton Law, prosecute the few persistent offenders that may later violate this Law Merchant.

Liability for Specification Guaranties

By Leslie Childs

WHERE a buyer of machinery or other equipment orders it from the seller through specifications only, the seller will not usually be held to guaranty beyond the specifications. In other words, where mechanical equipment of a certain type or capacity is ordered, and the buyer does not include in the specications any requirements as to the use intended, the seller will be held to have fulfilled his contract when he supplies the precise thing ordered.

The importance of care on the part of the buyer in situations of this kind is illustrated in a number of cases, and among these is a Wisconsin decision, reported in 188 N.W. 481, which arose under the following facts:

In this case the buyer required a fan that was to be used in the operation of four 100-hp. boilers. To be of service, this fan was required to have capacity "to permit the simultaneous operation of at least three of the boilers at 200-per cent rating." The specifications actually read:

"The fan with the stack shall have a maximum capacity sufficient to permit the burning of enough coal to permit the simultaneous operation of at least three of the boilers at 200-per cent rating, and shall be capable of delivering to the base of the stack when operated at normal capacity the products of combustion from the three boilers operating at normal load. It shall have a capacity of at least 20,000 cu.ft. of gases per min., and when operated with flue gases at approximately 600 deg. F. and the outside air 80 deg. F., the maximum available draft due to the fan, and measured in the furnace of the boiler farthest from the stack, shall be at least 0.65 in. of water pressure."

In reply to this letter, the manufacturer offered to supply such a fan for $538.00. The buyer accepted this offer. However, when the fan was tested in connection with the operation of the boilers it was found insufficient to develop "the simultaneous operation of at least three of the boilers at 200-per cent rating."

The buyers immediately called the manufacturer's attention to the insufficiency of the fan, and the latter, after being informed of the purpose for which the fan was purchased, replied that it had not been designed for any such result. Further, he called attention to the specifications which provided that the fan should have "a capacity of at least 20,000 cu.ft. of gases per min.," which was the basis upon which he worked in constructing the fan. Moreover, since he had not been informed of the purpose for which the fan was to be used, he was in no way responsible for the failure of the fan to perform properly.

The matter developed into a dispute between the parties, the purchaser refused to pay for the fan, and the manufacturer brought suit to collect the amount due. In defense, the buyer set up a counter claim for damages for the alleged breach of guaranty. Upon the trial the purchaser recovered a judgment. From this the appellant appealed, and the higher court reversed the decision, in part saying:

"It is conceded that at no time prior to the delivery of the fan was the manufacturer's attention called to the fact that it was to be used in connection with the operation of four 100-hp. boilers. There is no dispute on the part of the experts testifying in the case that the capacity of the fan is to be measured by the number of cubic feet of the gases per minute which it can handle; that the size of a fan required to permit the operation of at least three of the boilers at 200-per cent rating is an engineering problem, and that in order to design a fan to accomplish such result it is necessary to know the size of the boilers.

"The manufacturer contends that because the specifications for the fan were silent with respect to the size of the boilers, but did require a given capacity it was justified in assuming that the engineer who prepared the specifications had figured out the necessary capacity of the fan. There is nothing from which an intent on the part of respondents that appellant should solve the engineering problem of the required capacity of a fan necessary to produce the operation of at least three of the boilers can be inferred. It being conceded that the fan had a maximum capacity of at least 20,000 cu.ft. of gases per min., it complied with the warranty, and there is no basis for the buyer's counterclaim."

Miscellaneous Set-Ups at the Paducah Shops

By Frank W. Curtis
Western Editor, American Machinist

Tools set up for one job only—Operations on shoes and wedges, crossheads and connecting rods—Equipment for safe-ending flues

ALTHOUGH most of the machinery in the locomotive department of the Paducah, Ky., shops of the Illinois Central System is not of the single-purpose type, several of the tools are used for individual operations only, enabling work to be handled on a producton basis. At times some of the equipment stands idle, but whatever loss can be charged to this class of overhead is more than compensated for in the saving effected by having a machine available when wanted without having to wait for some overtaxed tool to finish a job, with the added expense of changing fixtures.

Shoes and wedges are machined in a planer-type milling machine equipped with fixtures that accommodate eight parts arranged in two rows of four pieces each. Either all shoes or wedges, or a combination of both parts, can be set up. A portion of a wedge set-up showing the arrangement of the cutters is illustrated in Fig. 1. The procedure in machining these parts is to load four pieces and then to start the cut, thus allowing the operator time to complete the loading of the remaining four pieces while machining is taking place. Two 20-in. and two 12-in. inserted-blade cutters are used, operating at a speed of 24 r.p.m. and at a feed of 6 in. per min. Approximately $\frac{1}{4}$ in. of material is removed from the surfaces machined. The machine handles shoe and wedge work exclusively. Another machine that handles one class of work only, is the draw cut shaper illustrated in Fig. 2, shown set up for machining a crosshead. The crosshead is located in an indexing fixture, permitting both faces to be machined to the same distance from the piston-rod hole. The tool head can be indexed so as to bring either a single-point tool, a broad-face tool, or straddle tools to the cutting position. The work is located on a tapered stud, corresponding to the taper on the piston rod, and is mounted on the indexing head at the front end. The crosshead is supported at the opposite end by an adjustable, tapered wedge at the bottom and centering brackets at the top. The indexing head is mounted in a slide so as to permit removal of the work.

After bushings have been pressed into connecting rods, it is necessary to drill grease holes through them in line with the grease cup openings in the rods. To avoid shifting the rods to another machine, the air-operated drilling device, shown in Fig. 3, is used. The device, consisting of a close quarter-air motor mounted on a column, is located far enough to one side of the bushing press so as not to interfere with its operation.

Connecting rods are ground and polished for appearance as well as for the elimination of scratches and other marks that are likely to result in surface checks, or cracks, when the rod is in service. Suspended grinders such as the one shown in Fig. 4, are used for the purpose. The work is supported on stands and all parts to be ground are within reach of the wheel. The grinder is so arranged that the wheel can be moved in all directions. Truck boxes are bored in a horizontal boring machine equipped with the fixture illustrated in Fig. 5. The box is located by its base and angular edges. Two clamps *A* operated by air-cylinders hold the box in place as shown. The clamps are attached to the levers *B*, which are pivoted by the pin *C* and attached to the links *D*.

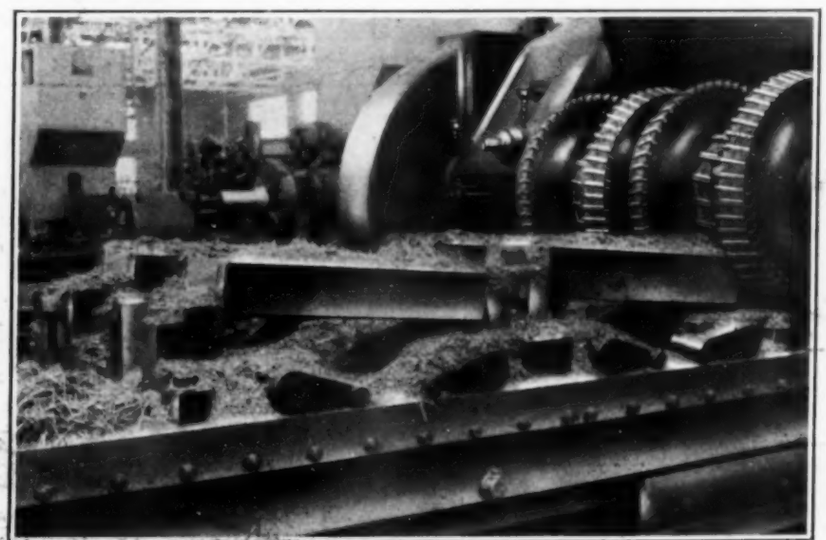


Fig. 1—Shoes and wedges are milled in a machine equipped with a fixture holding eight pieces. While some of the pieces are being machined, the other pieces are being loaded so that the operation is practically continuous. The cutters are operated at 24 r.p.m. The feed is 6 in. per min. Either shoes or wedges, or a combination of both, can be set up

[1] The seventh and concluding article.

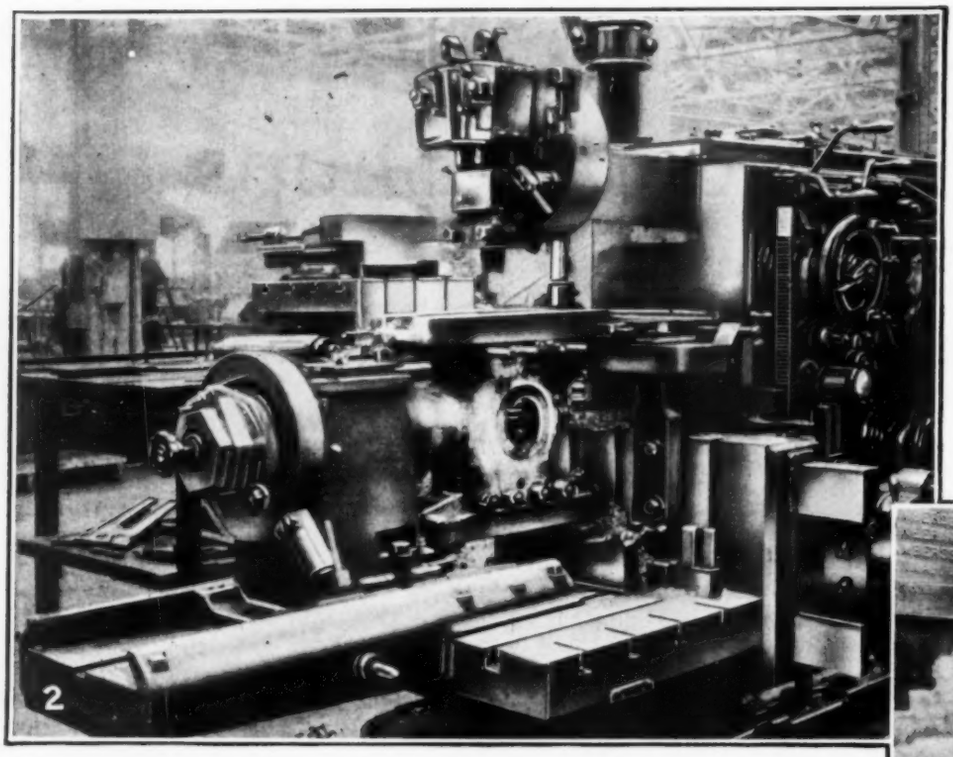


Fig. 2 — A draw-cut shaper used exclusively for machining crossheads. The set-up shows a crosshead located in an indexing fixture for machining the guide fits. A tapered stud corresponding with the taper of the piston rod is used to locate the work. The toolpost has an indexing head so that various tools can be brought to the work

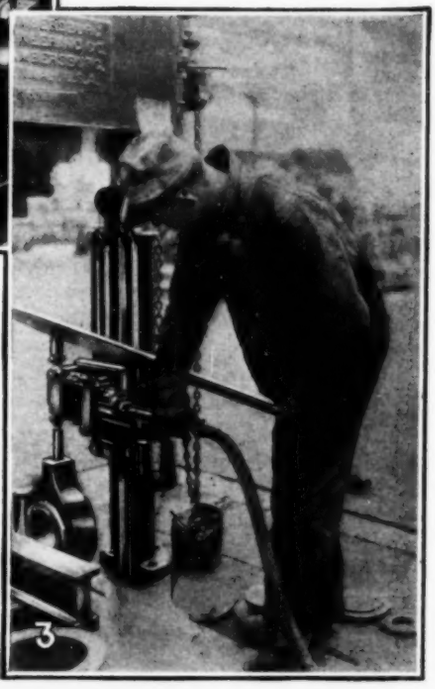
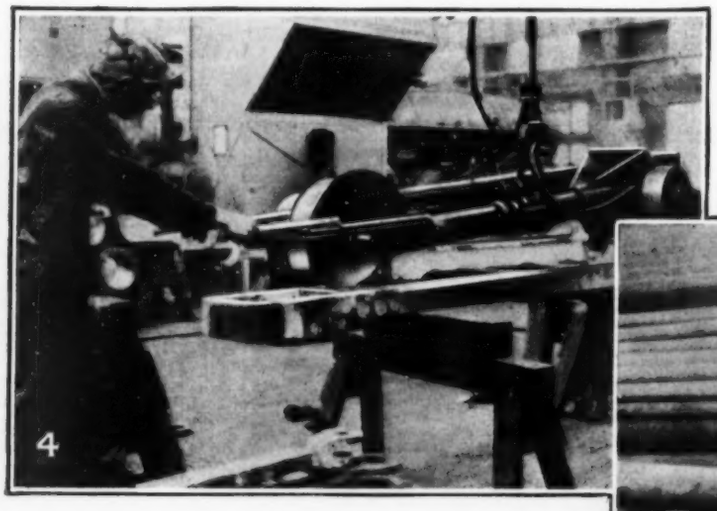


Fig. 3 — Drilling the grease holes in connecting-rod bushings. The drilling unit consists of a close-quarter air motor mounted on a column. The unit is placed far enough to one side of the bushing press not to interfere with its operation
Fig. 4—Suspended grinders, such as the one shown, are used to grind and polish connecting rods. The grinding head can be rotated and is so arranged that the wheel can be brought in contact with all surfaces without moving the rods



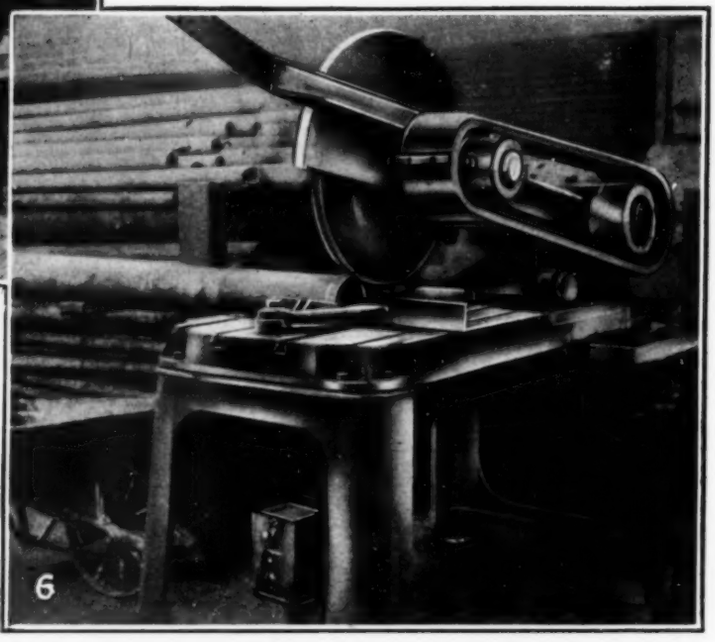


Fig. 6 — Flues to be safe-ended have their ends cut off in this saw. The saw is 24 in. in diameter and runs at 24,000 ft. per min. The flue end is cut off in less than one second. The saw is counterweighted and is driven by a 10-hp. motor

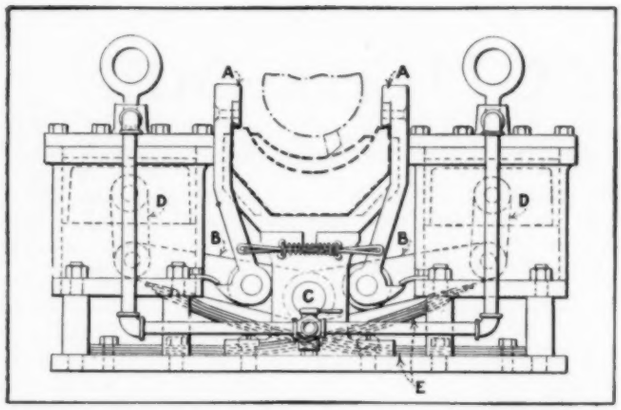


Fig. 5—An air-operated fixture used in boring truck boxes. Two clamps operated by air cylinders, through levers and links, hold the work in position. The pistons are raised by leaf springs under the levers, thus releasing the clamps

The upper ends of the links are attached to the pistons of air cylinders located at the sides of the fixture. When the pistons travel downward the clamps are drawn against the face of the box. Both pistons move in unison, being controlled by a valve located at the front of the fixture. The leaf springs *E*, bearing against the levers *B*, raise the pistons and release the clamps when the pressure is cut off and the exhaust is open.

Flues are repaired in a building adjacent to the blacksmith shop. Flues requiring to be safe ended have their ends cut off by the saw illustrated in Fig. 6. The saw is 24 in. in diameter and runs at approximately 24,000 ft. per min., being driven by a 10-hp. motor. The actual cutting time per flue is less than one second. An adjustable cam-clamp on the machine table permits the holding of flues ranging up to 6 in. in diameter.

Safe ends are welded to the flues in the electric welding machine shown in Fig. 7. The flue is clamped in stationary jaws, while the safe end is clamped in jaws that travel in a slide, being moved hydraulically. Clamping is by air pressure.

Both sets of jaws are interchangeable with jaws for different sizes of flues. Safe ends for the smaller flues are placed in the hopper shown over the machine, making it convenient for the operator to pick up one when needed. After the flue has been safe ended, the weld is flattened in the air hammer shown at the far end of the machine.

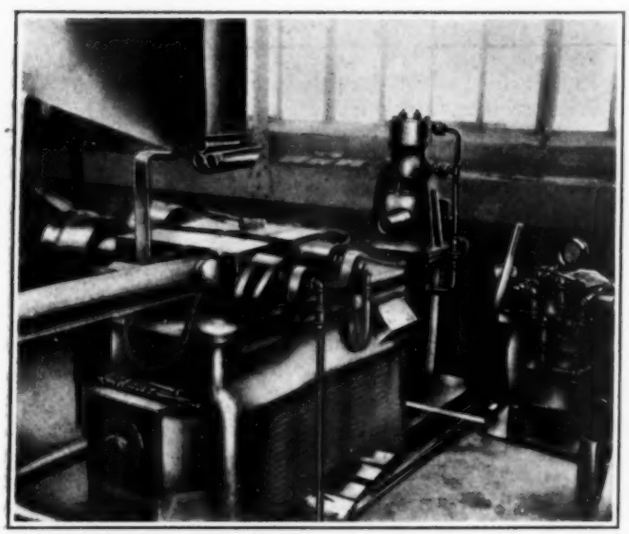


Fig. 7—In safe-ending flues, the flue is clamped by stationary jaws, while the safe end is held in jaws that slide under hydraulic pressure. Both sets of jaws are air operated for clamping. The weld is flattened in the air hammer at the far end of the machine

Notes from a Southern Railroad Shop

By G. B. Stuart

ONE of the large railroad shops located at Atlanta has all of its machine tools and cranes painted a bright red. The shop executives believe that it promotes cleanliness, besides making a more cheerful atmosphere as compared with the former solid, gloomy black. Personal interest in the condition of the machines, and cleanliness about the machines have also been stimulated by putting the operator's name in a conspicuous place on the machine. This has been extended to include painting the engineer's name on the side of the locomotive cab in cases where the engineer has shown a long successful running period.

Breaking of side rods and valve gear in service has been eliminated by more attention to machining. Hogging cuts at high feeds saved time in machining, but they set up strains in the metal. No cuts are now permitted that leave pronounced tool or chatter marks on the work. All corners and edges of rods are well rounded with a file, or chamfered, as it was found that sharp machined edges gradually developed cracks that spread inward. Welding is no longer permitted on rods, as it has been found more economical in the long run to put in a new rod where cracks or breaks have occurred. Rods and links are no longer painted, but are polished so that casual inspection will show any cracks developing in service.

The practice of the automobile builder to use castellated nuts throughout has been adopted for locomotives, with the result that breakage from the loosening of nuts has been entirely eliminated. Patching of fire boxes and boilers is being discouraged. If burn-outs or breaks develop in plates an entire new section of plate is put in, regardless of the cost. This practice has shown ultimate savings, and a much more satisfactory job in each case.

Milling is done in preference to planing, wherever possible. Time saving by milling is the big feature, but it is also believed to produce a better finish and a sounder job. Time savings as high as 200 per cent have been made over the old planing methods. Rods and links are now sent through the machining operations in lots of similar pieces instead of running them through in sets, thus getting the work down to a production basis.

An entirely new policy in stores control has developed within the last few years. Quantities of finished parts in stores have been cut 50 per cent below what they were a few years ago. This policy has reduced heavy inventories, but more important still has been its effect on design changes. Formerly a standard part was used for replacement, or, in the case that a change was made, all of the parts in stock had to be scrapped. If weaknesses of parts now show up in service, a change in design can be made at once. Closer control has had to be kept of general overhauling schedules, however, so that for an engine coming in for new cylinders or other parts at a given time the parts can be ordered in advance.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Loading and Unloading Cars Simplified by Lift Truck and Bridge Plate

By George H. Feltner

In loading and unloading box cars it was formerly necessary to have the cars stationed at a loading platform, so that the load could be handled conveniently. Owing to the limited length of platforms and to the increased amount of materials handled at certain periods, the shifting of cars caused inconvenience as well as delay. Much of this difficulty has been overcome, however, by the use of lift-trucks. To enable the front wheels of the

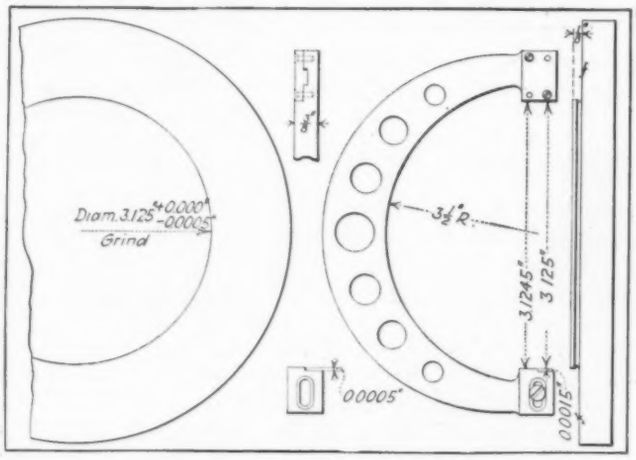
Loading finished material into a box car

truck to pass under the side of the car, so that the load can be placed within it or taken therefrom, a steel plate is laid over the edge of the cement roadway and onto the bottom flange of the far rail, as shown. Handling materials in this way makes it possible to load or unload a car with ease at any location along the siding.

A Special Snap Gage

By H. L. Wheeler

A piece of production work is shown in the illustration that gave us considerable difficulty for the reason that it is practically impossible to apply standard micrometers or commercially available snap gages to the 3.125-in. diameter shoulder because of the short distance it projects from the larger part.



Snap gage for close-up work

After trying several different gages we finally made the one here shown, which is quite satisfactory. One of the measuring anvils is made with two faces, one being 0.0015 in. in advance of the other, which gave us our tolerance. This anvil is adjustable.

A Feeler Indicator for Faceplate Work—*Discussion*

By W. H. Storey
Croyden, England

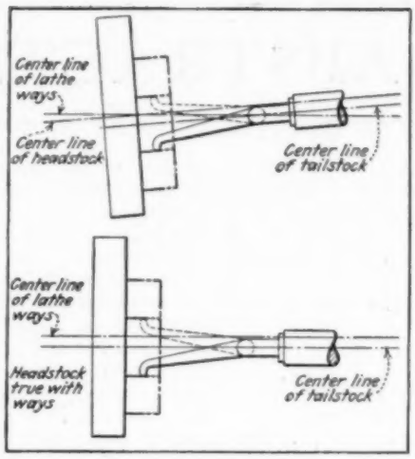
In an article under the title given above, on page 822, Vol. 67, of the *American Machinist*, H. Moore describes an indicator that I do not think has much value.

From his statement, that with its aid a job can be set so that the hole runs true, without revolving the spindle, it is obvious that Mr. Moore is under a delusion. He is by no means the only one who wrongly uses this method of setting up work on the faceplate, as I have found many of the experienced mechanics (so-called) who have been under my charge, working under that same delusion in good faith.

To these mechanics I have proved the fallacy of this method by the diagrams illustrated, from which it will be obvious that if the hole in the work be set true with the feeler revolving about the tailstock centerline, it will generally be out of center with the headstock centerline, and the work will revolve eccentrically when the faceplate is revolved. In the illustrations, the lathe inaccuracies are greatly exaggerated.

Of course, if the lathe were absolutely true in every particular, the method outlined by Mr. Moore would be correct, but machine tools are not dead true, and even

if they were, it is surely preferable to use some method that will give accurate results independently of their condition. The diagrams show but two of the many conditions under which it is fallacious to use the method described by Mr. Moore. I have found that even when using lathes of reputable make, only a few months old, that work set by Mr. Moore's method was often as much as 0.009 in. out of true, and on old lathes the inaccuracy was often three times as great.


Center line of lathe ways
Center line of headstock
Center line of tailstock
Center line of lathe ways
Headstock true with ways
Center line of tailstock

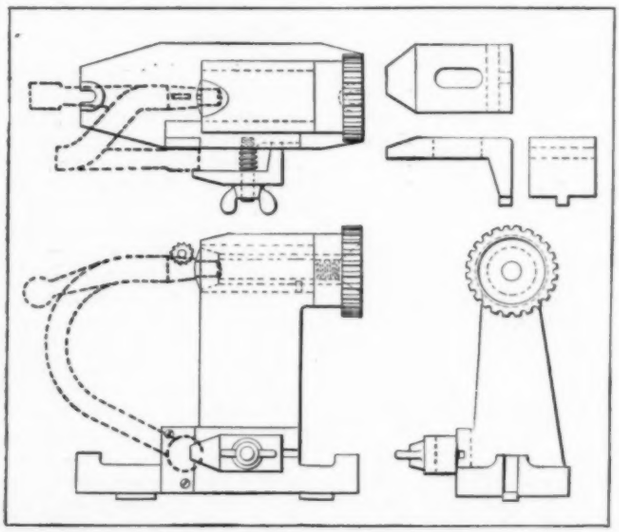
Diagrams showing the inaccuracy of setting up faceplate work by indicating it from the tailstock spindle

Adapting Commercial Parts in Jig and Fixture Design

By H. L. Wheeler

In the design of jigs and fixtures there is often an opportunity to reduce the cost by incorporating commercial parts of machines. These parts may be taken from machine tools, automobiles, etc. The milling fixture shown in the illustration is a typical example, the feature of which is the use of a standard draw-in collet commonly used on lathes, for holding the work.

This fixture is designed to hold a steering-arm forging while milling a Woodruff keyway in the tapered section. The operation is performed on a hand milling machine. The fixture accommodates a standard $\frac{5}{8}$-in. draw-in collet, which fits into a hardened and ground steel sleeve pressed into the body of the fixture. This sleeve is provided with a pin that engages the keyway of the collet to resist turning action.



Fixture in which the holding member is a draw-in collet

A notched hand nut quickly opens or closes the chuck. The $\frac{5}{8}$-in. stem of the steering arm is inserted in the collet against the shoulder, bringing the tierod boss in contact with the stop plate H at the bottom, thus locating the position for the keyway. A sliding clamp is tightened against the tierod boss by a wing nut, and provides additional support for the work. The clamp has a key in the bottom, fitting into a corresponding keyway in the fixture to keep it in place when released. A coil spring under the clamp, holds it out and prevents it from dropping down and obstructing the loading of the fixture.

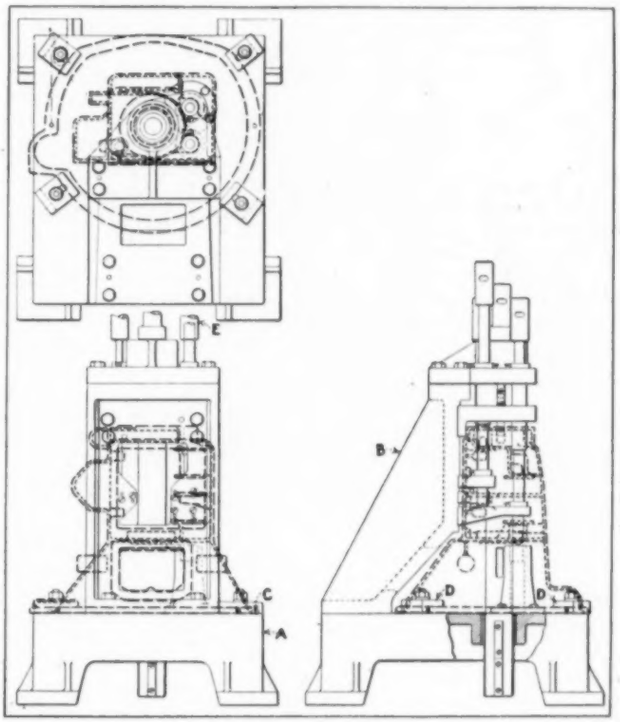
The milling cutter should rotate so that the pressure of the cut is against the shoulder. Threading the stem on this forging is done after cutting the keyway. By this arrangement a better surface for holding the forging in the collet is possible, and there is no danger of damaging the thread.

A Boring Fixture

By Edward T. Heard

The illustration gives constructional details of a fixture used for boring the bearings in a reversing-gear case of a six-cylinder marine engine of the internal-combustion type.

The fixture, in which the work to be bored is shown in place by heavy dotted lines, consists of the base A, to which the angle plate B is attached by screws and dowels;



Fixture for boring reversing-gear cases

the clamps D; and the guide bushings for the various boring bars. The work is located by the pins C entering holes previously drilled.

To provide for longer life, the boring bars are each fitted with four hardened-steel strips where they bear in the bushings. When these strips wear, they can be packed out with shims and reground. The boring bars, with the exception of the one shown at E, use ordinary cutters. Bar E is equipped with an adjustable block-cutter of the Kelly type.

· TECHNICAL · ABSTRACTS ·

Materials Handling Equipment

The modern plant cannot risk a loss of production, through lack of inspection, maintenance, or the necessary replacements of its tools. Materials handling equipment is no less a tool of production than is the turret lathe or the bandsaw. The fundamental types of conveying equipment used in manufacturing processes are few in number, which simplifies greatly the problem of inspection. These types have as their principal elements, gravity rollers, chains, belts, overhead carriers, lift trucks, elevating platform trucks and tractors.

One of the most important changes now taking place in conveying machinery design is the use of anti-friction bearings and pressure lubrication, which are of advantage from the maintenance standpoint. In addition, power consumption is reduced 30 to 40 per cent, which in the case of long horizontal conveyors means large enough savings to pay for the extra cost of the new bearings.

It is a safe assumption that an installation of mechanical handling equipment with anti-friction bearings in rollers and journals will not become obsolete through further reduction in friction factors during its period of usefulness.

There is no set rule by which we may fix a time for replacements of material handling equipment, but there is one common-sense practice that serves as a rough guide. This practice is to keep the machinery running by means of proper maintenance as long as it can be made to go without breakdowns. In general, all such equipment is of simple construction, rugged, and easily attended to. Furthermore, as already pointed out, radical improvements are infrequent. Therefore, careful watching of new developments will enable the plant management to replace old, obsolete equipment with the improved types.—Edward J. Tournier, *Industrial Engineering*, March.

Ford's Material Control

Material inventory control may be said to be responsible for the success of Ford's enterprises. To obtain real control, he has reached back to raw material sources. To supplement these, he has organized a complete transport system which serves two functions: (1) as a means of moving material; (2) as a means of setting the pace. A six days supply of finished parts is always in transport, a real example of co-ordination. The result is an inventory 75 per cent less than that of 1921. Ford adheres to the laws of material control which are: (1) the highest efficiency in the utilization of materials is obtained by providing the required quantity of the required quality and condition at the required time and space; (2) the highest efficiency in the storage of materials, tools and supplies is obtained by providing a definite place to store every item, keeping every item in its assigned place and keeping an adequate record thereof.—John Younger, *Manufacturing Industries*, February.

Abrasive Engineering Practice in Automobile Manufacturing

Abrasive processes followed in finishing automobile bodies consists of rubbing down, successively, coats of filler, paint, varnish or nitro-cellulose lacquer to a smooth surface. The process generally is lengthy and painstaking where a high-grade finish is desired. Pronounced irregularities are first reduced with a file and the all remaining surface imperfections are removed with abrasive cloth. Aluminum bodies are washed with a volative solution, while steel bodies are gone over with a preparation that removes rust and grease.

A rapidly revolving disk of abrasive material, driven through a flexible shaft or by a direct connected motor, is sometimes used o rub down the body before applying the rough stuff. The use of power-operated equipment reduces the time materially. After the body has been brought to a satisfactory surface the next step is the application of a priming coat, which is usually brushed on the bodies, though fenders, radiator covers, aprons etc., may be sprayed. The operation is technically known as priming.

Five coats of the rough stuff are applied successively, with drying periods between, and each coat is rubbed down with hone gangs consistings of a number of small pieces of abrasive stone bound together with cloth to form a flexible unit. The next step is to apply the color, the first coat of which is allowed to dry flat—without luster—after which a coat of color varnish is applied and when dry is rubbed down with No. 4/0 flint paper which has been soaked in linseed oil. Three more coats of color varnish are applied, each being dried for 24 hours and rubbed down with pumice powder and water.—*Abrasive Industry*, March.

Locating Faults of Treatment

When a plant manufacturing articles of steel experiences difficulty in turning out a first class product because of faulty material it is very necessary to differentiate between various possible causes. A full investigation will usually reveal the source, place the responsibility and point to the correction.

An overlap, seam or crack formed during hot-rolling or forging is always filled with oxides of iron or slag. Quenching cracks occurring under the surface of the quenching medium will be free from inclusions. Grain flow determination is a means of distinguishing defects caused by rolling from those created during the forging operations. Defective rolled bars or billets have all the overlaps and seams parallel to the direction of rolling. Forging cracks usually occur at the apex of sharp angles formed in the grain flow. Quenching cracks usually appear where two heavy sections are joined by a light one, or where an otherwise smooth surface is marred by a tool mark or similar defect.

Banding stands somewhere on the borderline between the properties produced by mechanical and those caused by thermal treatment. Its influence causes a slight lowering of physical properties when tested in a direction perpendicular to the banding. To determine its presence one has only to cut a sample parallel to the direction of the last deformation and examine it at about one hundred diameters. The almost parallel rows of pearlitic grains alternating with ferrite form a pattern that can hardly be mistaken.

Even the best steel on the market can be made unfit for use if the thermal processes to which it is subjected are not properly supervised. Burning is the worst thing that can happen to steel. Its possibility is almost directly proportionate to the carbon content. It is almost impossible to burn a .02 per cent carbon steel, while a steel with one per cent carbon may be burnt, even in a well equipped and well controlled shop.

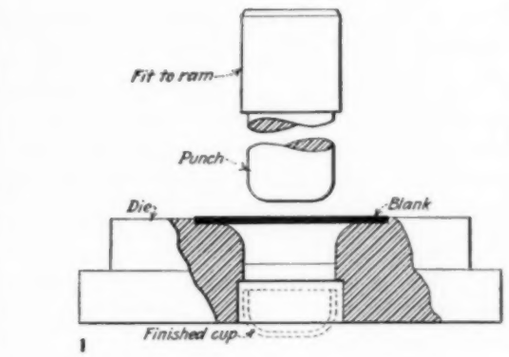
Burning disrupts the metal to metal contact of crystalline constituents by interposing between them a layer of oxides or substances of an eutectic nature. It increases disproportionately the grain size and reduces the physical properties of the steel to those of oxides.—*Forging and Heat-Treating*, February.

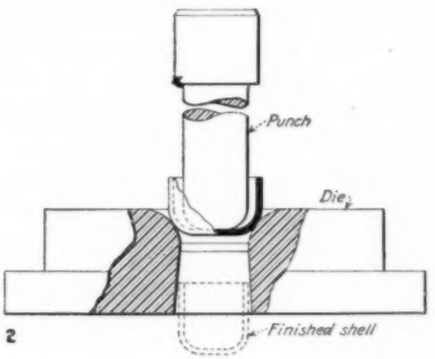
Extrusion of Bismuth Wire

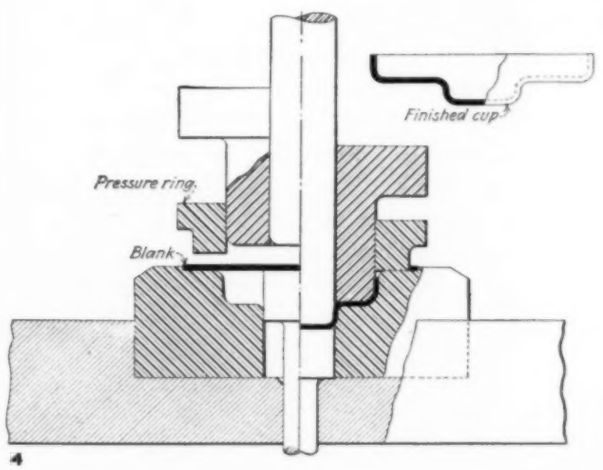
Bismuth wire is used in thermopiles, where a combination of bismuth and silver is considered advantageous. Since it cannot be drawn by ordinary methods some rather unusual processes have been employed, including the pouring of molten bismuth from a height upon a smooth glass plate, rolling the resulting sheet and cutting the sheet into strips.

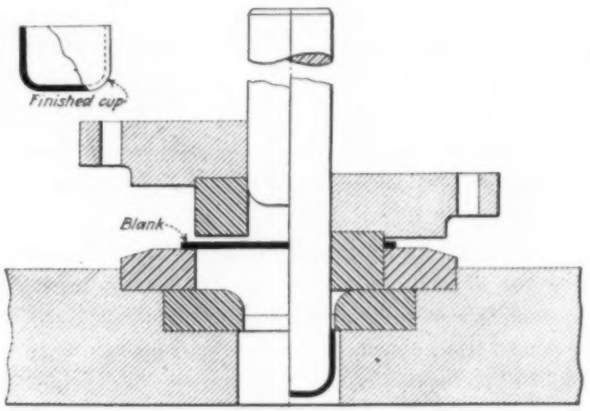
Recently a method has been developed for making circular wire by forcing the metal through an orifice 0.004 in. in diameter. The bismuth is introduced into the press either in powdered form or as a slug, heated to about 210 deg. F. The wire is said to be so pliable that it can be wound upon a spool as fast as it is formed. It can be wound upon a $\frac{1}{8}$ in. diameter rod and straightened out again without breaking, if care is exercised. It possesses a fair tensile strength.—*Machinery*, February.

Typical Drawing Dies for Sheet Metal









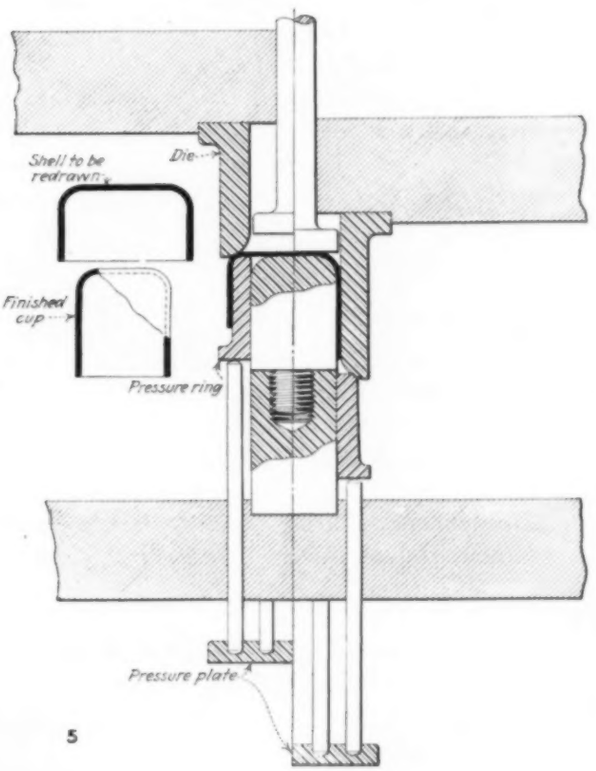


Fig. 1—Plain form of drawing die to be used when the part has been previously blanked. The counterbore in the die aids in stripping the shell from the punch

Fig. 2—A redrawing die of plain design for the second operation on shells which cannot be completed in one draw. Usually, it is necessary to anneal the work prior to making the redraw

Fig. 3—Shells of a simple nature can be formed in a combination blanking and drawing die such as shown here. Dies of this type are mounted in double-action presses, and arranged so that the cutting and drawing sections can be replaced

Fig. 4—A double drawing die for an irregular part. A pressure ring holds the work firmly in order to avoid wrinkles, then the outer draw is completed, after which the central punch draws the smaller form. The plunger in the die aids in keeping the work in place while being drawn, and also ejects the finished cup

Fig. 5—A redrawing die for forming shells made of metal which is likely to wrinkle and which cannot be drawn in a plain-type die. Pressure exerted between the die and the pressure ring iron out the work as it is drawn. Ejection from the punch is made by the pressure ring

Continued on Sheet 13a

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Business Is Good, Notwithstanding

POSSIBLY we do not need to worry about the business cycle any more. Having weathered the Florida debacle, the Mississippi Valley disaster, the lesser flood disaster in New England, and the Ford depression without seriously disturbed financial equilibrium, there is much cause for a feeling of elation. In the opinion of some of our soundest observers, the bottom of a business slump was passed several months ago. They point out that the amount involved in building contracts let during the first two months of 1928 has climbed, that more building materials were sold during this period than during the corresponding period in 1927, and that unemployment is now decreasing. They say that the building industry, if we were going down instead of up, would reflect such movement. They also point to increasing sales of machine tools as indicative of preparations for increased production.

The presidential campaign still has to be gone through. Nothing very serious is predicted as to its effect. If it turns out that a new president is elected without the accompaniment of at least a semi-serious falling off of business, then surely we may question the dominance of the old business cycle. Times have changed if we can absorb the Florida, Mississippi Valley, Ford and presidential election shocks during a comparatively short time without feeling a decided rocking of the boat.

Recommended—a National Association of the Shipping Industry

THAT many of the problems now perplexing maritime shippers could be solved by a National shipping organization seems to be a sound conclusion. Other industries have their associations and benefit by them—why not the shipping industry? With leadership in the industry itself—even militant leadership—to define shipping problems and to present them with proposed solutions to the public and to Congress, something would be accomplished.

A National shipping organization could advance plans for the improvement of the industry itself, establish efficiency, and eliminate waste just as organizations in other industries do. Through such an organization the shipping industry could present a united front in proposing legislation, instead of leaving to the law makers, who are not experts in shipping, the analysis of shipping troubles and the introduction of proposals to cure them. England has profited through her Chamber of Shipping, now in its fiftieth year. All shipping problems except those involving labor are handled through this organization. It proposes legislation, makes recommendations, serves the Empire as well as itself. A separate body, the Shipping Federation, handles shipping's labor troubles.

A strong shipping industry, competing favorably with the merchant fleets of other countries, would mean more export business for all industry. If we are going to compete with other countries for orders that involve shipping by water—and we are—we must go at the job whole-heartedly. One essential in doing a job that way is to have a foundation on which to build, and the shipping industry itself should provide that by setting up an organization thoroughly representative, and with enough authority to act for the industry when its voice should be heard.

Executor Productionis Capricornus

IN OLD Roman days they may not have had any citizens corresponding to the production department heads of today, but they undoubtedly had individuals who were just as much the goats in the whirl of trade as are the production men of our times. And possibly they were too dignified in those pompous days to attach to such victims the term "capricornus," or goat. We are not.

If you doubt the soundness of this contention look at the situation in the mighty automobile industry. A competitive war to the death is in full swing, but who is in the front rank of the shock troops? The production superintendent and all his staff.

Production men, since the war, have become accustomed to bearing the brunt of every cost reduction. They have even accomplished big enough savings in this direction to offset some of the higher selling costs, but there must come an end some time. There is a limit to the endurance of even the hardy goat. It will not be wise, aside from the fairness of the thing, to keep on expecting all the savings to be made by the production men.

· SHOP · EQUIPMENT · NEWS ·

"Hydro-Matic" No. 12 Internal Grinder

SEVERAL radical departures in design from standard practice are found in the No. 12 "Hydro-Matic" internal grinder recently placed on the market by the Greenfield Tap and Die Corporation, Greenfield, Mass. High production, accuracy, safety, and compactness are featured. In Fig. 1 the complete unit is shown.

Contrary to standard practice, the grinding wheel in this machine enters the work from the rear instead of from the front. As in other GTD internal grinders, the workhead is reciprocated by means of oil under pressure so that a wide range of table feeds is available.

Since the grinding wheel, the axial position of which is fixed, enters from the rear, as can be seen in Fig. 2, it is at no time exposed, and even when the workhead is in the loading or unloading position the wheel is back out of the way, practically out of sight, and completely protected; hence it is impossible for the operator to come in contact with the wheel. Because his attention is not diverted by the danger of coming in contact with the revolving wheel, the operator can work faster and more effectively. The operator's position is at the front end of the machine where the control levers are all placed within easy reach.

Another advantage of the enclosed design is that the coolant floods the work and the diamond truing device at all times, thus maintaining a constant temperature, and preventing any expansion or contraction with consequent inaccuracy of the finished product.

A semi-automatic sizing device is also featured on this machine. Automatic action of the feed screw is governed by a cam so arranged that successive strokes of the table result in progressively diminishing increments of feed. When the roughing cuts have been taken, the movement of a lever causes the diamond to trim the wheel, after which the finishing cuts are taken. The automatic feature is the fact that definite feed increments are taken after the wheel is trued for the finishing cut. These increments do not vary as they are governed by the positive action of the cam. The diamond itself is fixed at all times and does not move out of its truing position. The advantages claimed for the cam feed with its diminishing increment are that the heavier roughing cuts are taken with a clean, sharp wheel. As the wheel dulls or becomes loaded, less strain is put upon it, thus minimizing the tendency of the spindle to spring under pressure and grind bell-mouthed holes. The truing of the wheel just before the finishing cut removes this dulled or loaded surface and assures an accurate finish.

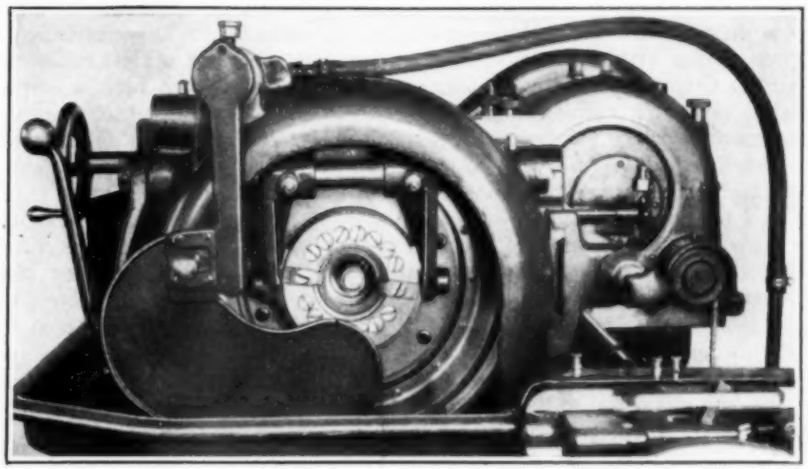


Fig. 2—Close-up view of the workhead and grinding wheel

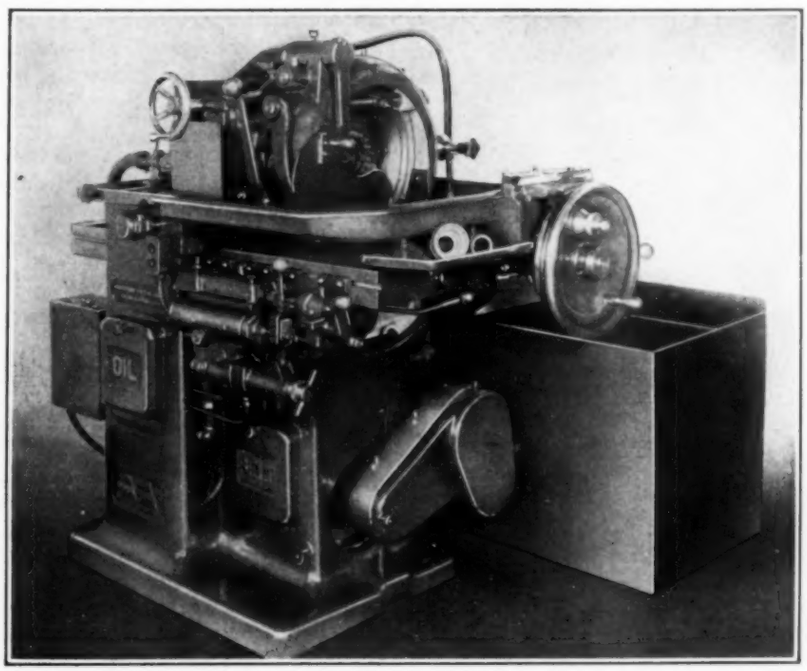


Fig. 1—"Hydro-Matic" No. 12 Internal Grinder

To further assure accuracy, the bearings of the workhead are made of ample size, and are arranged so that the work is practically inside of the bearing, so that misalignment, if present, is minimized instead of magnified. As a result of this and other features of design, it is claimed that the machine will grind in production to within limits of 0.0002 to 0.0003 inch.

Since the No. 12 Hydro-Matic is

essentially a production machine, it is regularly furnished with one workhead feed. Other feeds are readily available by the use of change gears in the box placed in the end of the machine. Ball bearings are used throughout on all revolving parts, including the hand-operated shafts. Operation of the machine is entirely mechanical and no electrical contacts are present. Motor drive from a single motor is regularly furnished. Belt drive can be supplied, if required, through a single belt. The capacity of the machine is for holes ¾ to 3 in. in diameter, and up to 4 in. in depth. The workhead can be swiveled for taper grinding. The machine occupies a floor space of 42½x73 in. and weighs 5,500 pounds.

Norton 24-Inch Swing-Frame Grinding Machine

THE development of Bakelite-bonded grinding wheels has made high-speed snagging practicable. To provide a means for operating such wheels and at maximum efficiency, the Norton Company, Worcester, Mass., has developed a swing-frame grinding machine which has been designed especially to meet the requirements of high-speed wheel service. In Fig. 1 the complete unit is shown.

Although this machine weighs only 850 lb., it is very rugged and powerful. The light weight and the fact that the machine is balanced both laterally and rotatively make it easy to handle.

Attention is called to the fabricated steel hood, which provides a maximum of protection for the operator and which complies in every respect with safety code requirements for wheels which are operated at 9,000 ft. per min. Wheels 24 in. in diameter, from 2- to 3-in. thick and with either 8- or 12-in. holes can be accommodated. Two speed changes are possible through the medium of a duplex sheave on the motor. Wheels either 24 or 20 in. in diameter can be operated at 9,000 ft. per minute.

The wheels on this machine are driven by two flexible V-belts, one on either side of the wheel. These belts not only shed all foreign matter but are practically slip-proof. The use of this driving medium permits making the wheel flanges and sheaves integral, resulting in a very narrow wheel assembly. This construction gives the operator a clear vision on either side of the machine, a feature which makes the machine particularly well suited for billet grinding purposes.

Wheel changes are made very simply. A toggle arrangement on the motor releases the V-belts. A single bolt is removed and the wheel head dropped to the floor, as shown in Fig. 2. The old wheel is then removed by taking off a combination sheave and flange. Heavy-duty, cartridge-type ball bearings are provided. The complete bearing assembly, which is dust-proof, is within the hole of the wheel.

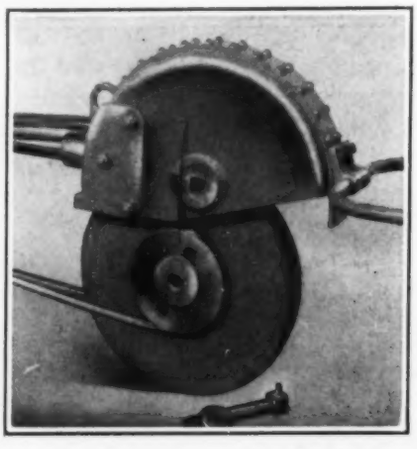


Fig. 2—Grinding wheel assembly

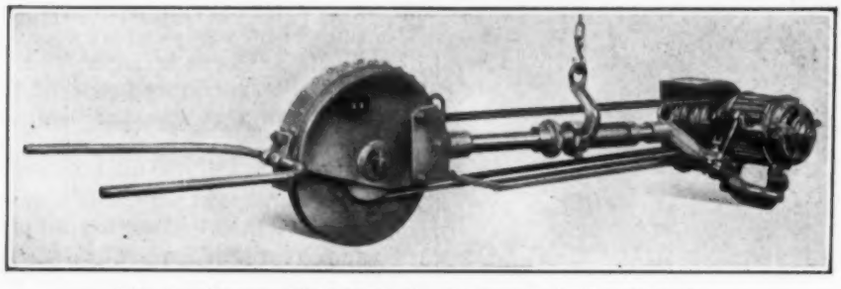


Fig. 1—Norton 24-Inch Swing-Frame Grinding Machine

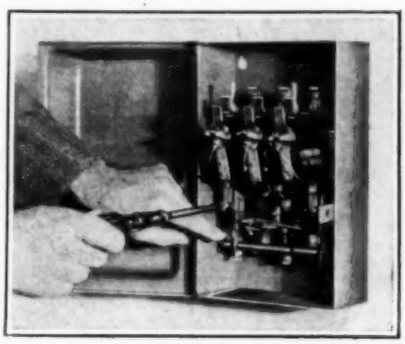
Suspension of the machine can be made in two ways: At the center only where the head room is not great or where this type of suspension is preferable. In this case a simple and quick screw adjustment is provided to compensate for loss of weight in the head of the machine due to wheel wear. A second way is that it may be fastened rigidly with a cable to the ceiling at the rear with the wheel head supported by a counterweight rope running over pulleys.

Completely-inclosed ball-bearing motors of 10-hp. capacity designed for grinding duty are used for a.c. installations. Push-button control on the wheel guard is within easy reach of the operator. A sheet-iron guard to protect the V-belts and motor sheaves from grinding-chips is part of the standard equipment.

Westinghouse "Linestarter" for Small Squirrel-Cage Motors

A squirrel-cage motor "Linestarter" device with a maximum rating of 7½ hp. has recently been announced by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The addition of this Linestarter now provides a complete line of full-voltage starting devices ranging from 1 to 75 horsepower. It is particularly suited to the starting and protection of small induction motors driving machine tools, textile machinery, woodworking machines, pumps, fans and many other machines where remote control with complete protection to operator, motor and machine is desired. It can also be used as a magnetic-primary switch for wound-rotor motors within its capacity.

This Linestarter provides a desirable feature in its adaptability to either hand or automatic reset after an overload. It comes equipped with hand reset of the thermal-overload relay, but if automatic reset is desired the hand-reset lever can readily be removed and automatic reset obtained. Automatic reset has many desirable advantages since the modern tendency is to mount these small starters within the base of the machine they control, in which case pro-



Westinghouse "Linestarter" for Small Squirrel-Cage Motors

vision for hand reset might be difficult to obtain.

Thermal-overload protection is provided in this Linestarter as in the others of larger capacity. The thermal-operating elements consist of high-temperature thermostatic-metal strips which are deflected due to heat from the heater elements when the motor is overloaded.

All operating parts are attractively finished to prevent corrosion and maintain good contact between parts. The copper and brass parts are tinned, while the iron and steel parts are cadmium plated.

The cabinet housing the mechanism of this device was proportioned so that ample space was provided at both top and bottom for drawing in wires and making connections without the necessity of removing the mechanism from the cabinet. The approximate dimensions of the dust-proof inclosing cabinet are $8\frac{1}{2}$x$12\frac{1}{2}$x$5\frac{3}{4}$ in. and the weight is 15 pounds.

Robertson Production Power Hacksaw

THE No. 4X power hacksaw manufactured by the W. Robertson Machine and Foundry Company, 56-58 Rano St., Buffalo, N. Y., is suitable for cutting all metals. It has a capacity of 9x9-in. and frame speeds of 72 or 100 strokes per minute for cutting hard and soft metals.

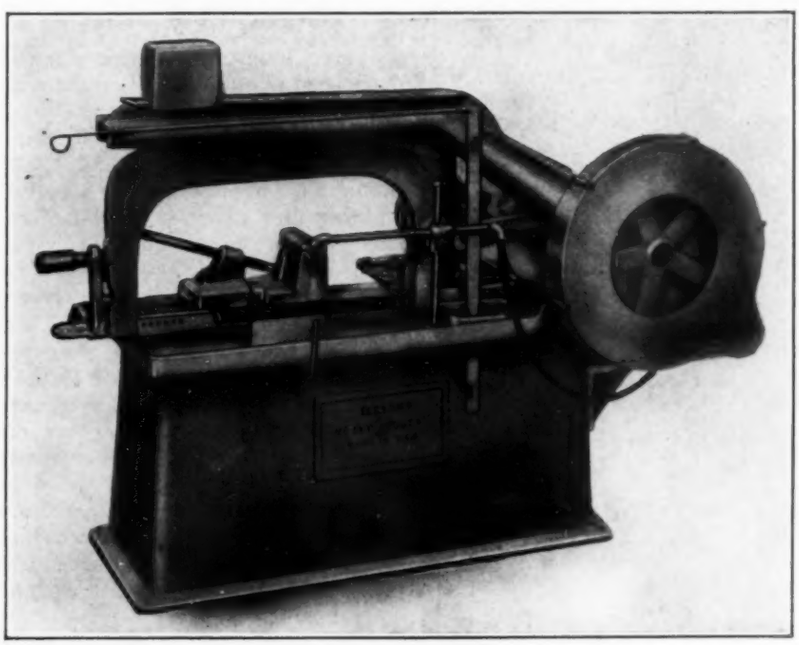
The machine is heavily and rigidly constructed. The base is of the box type, forming a large receptacle for the cutting liquid while adding to the rigidity. The base and bed are machined parallel and screwed together at six points. The bearings which are phosphor-bronze bushed are ample in size and supplied with numerous oil cups. The clutch has a diameter of $4\frac{1}{2}$-in. and a face of $1\frac{3}{16}$-in. and is expanded by a hardened steel cone. It is operated by an extended lever located in a convenient position. It automatically disengages when the cut is completed.

This machine is equipped with an oil-compression-lift feature, a simple yet effective method of lifting the frame and relieving the blade teeth of all back drag on the return stroke. With this feature it is impossible for the frame to fall on the work and break blades. When the oil reservoir is once filled, it requires practically no further attention. It is timed so that when the machine stops automatically at the end of the cut, the frame will stay at any position of its swing until released by opening the valve.

The vise is made to stand a great amount of strain. It is of the quick-acting type and is immediately adjustable from 0 to 9 in. It also may be swiveled to 45 deg. for cutting stock at angles.

There are few adjustments and these are simple. The frame is adjusted by a single gib inside the arm bearing; the clutch by the setscrew which rides on the cone; the oil lift by the rear plunger which when raised gives less and when lowered gives more lift. The vise is swiveled by loosening two nuts and setting at the required angle.

The machine is driven by a $\frac{3}{4}$-hp. motor, running at either 1,200 or 1,500 r.p.m. The pulley speed is 170 r.p.m. The working floor space is 26x62 in., while the height is 41 in. The weight of the machine is about 700 pounds.

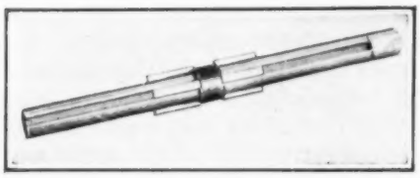


Robertson Production Power Hacksaw

Le Count Improved Expanding Mandrel

The principle involved in an expanding mandrel recently placed on the market by W. G. Le Count, South Norwalk, Conn., is very simple. At equidistant intervals around the circumference of the body are cut four longitudinal splineways, the bottoms of which are inclined with respect to the axis of the mandrel, and in each splineway there is a sliding key that is tapered upon the bottom to correspond to the incline. The exposed edges of the keys are ground parallel.

Midway of the length of each key is a rectangular-shaped notch deep enough to permit the introduction of a collar that is smaller in outside diameter than the smallest hole to be accommodated by the mandrel. The tool is assembled by placing the four keys inside the collar, entering the ends of the keys in the respective splineways and sliding them together



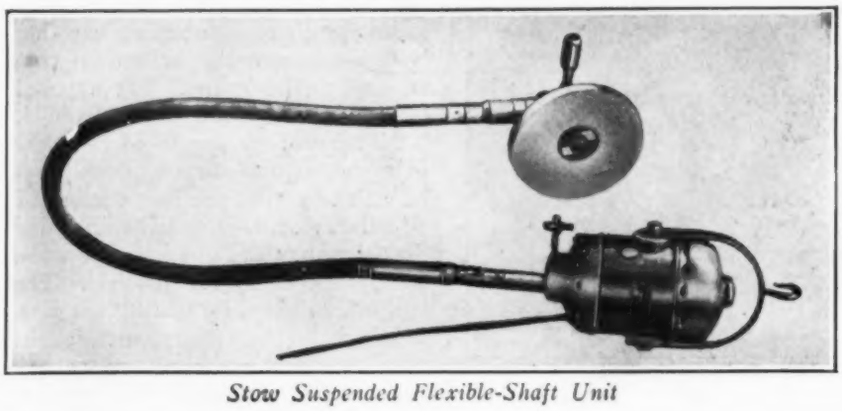
Le Count Improved Expanding Mandrel

upon the body. The collar prevents the keys from being displaced, yet permits them to slide freely.

Mandrels are regularly furnished in sets of four, accommodating holes from 1 to $2\frac{5}{8}$ in. in diameter. The amount of taper given to the bottoms of the splineways is not the same for all tools, but is so calculated for each that the largest hole accommodated by one mandrel is of the same size as the smallest hole that will go over the next larger size of mandrel, thus preserving an unbroken range between the limits of the set.

Stow Suspended Flexible-Shaft Unit

Overhead suspension of a source of flexible power is the principal feature of this unit devised by the Stow Manufacturing Company, Binghamton, N. Y. It may be suspended over the operation to be performed and swung out of the way as required. The flexible shaft is mounted in ball bearings and is driven by a ball-bearing motor of 1 hp. The shaft may be furnished to suit requirements. Rotary motion is taken from an angle-head in the illustration, but may be taken directly from the end of the shaft to drive rotary files, abrasive wheels, polishing wheels and other attachments. It is pointed out that the device will take up no floor space or bench room.



Stow Suspended Flexible-Shaft Unit

"Triplex" Automatic Nailer

For driving three nails simultaneously on crating or box work the "Triplex" automatic nailer, Fig. 1, has been designed by the Duplex Automatic Nailer Company, Logansport, Ind. The nails are driven on center distances of $1\frac{1}{4}$-in. The machine will drive 60 nails per minute while hourly production will fall between 3,000 to 3,600 No. 8 cement-coated or common nails. The apparatus is light in weight but has sufficient strength to withstand heavy-duty continuous work.

The nails are placed in the hopper, Fig. 2, without any particular arrangement. The hopper is provided with slots through which the nails find their way due to up-and-down motion of the nail hopper and drive mechanism. As three nails are driven, three more are released and fall into the nail pockets. When the machine is moved to the next point, the hammer is raised sufficiently to allow the nails to fall into the tubes. The hammer is then lowered and air under pressure is admitted. It is claimed that no nails are bent in driving. The machine requires air in quantities comparable to those demanded by other small pneumatic tools. The machine will replace three men.

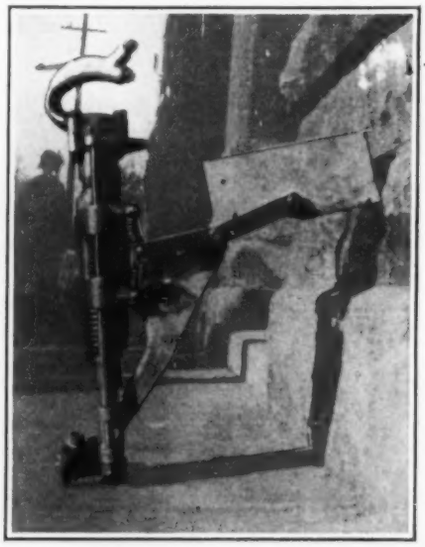


Fig. 1—"Triplex" Automatic Nailer

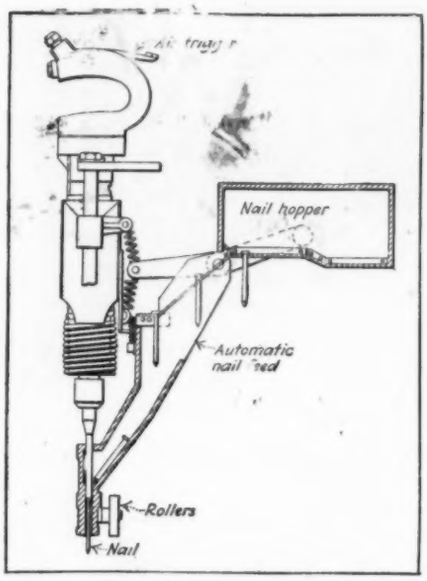
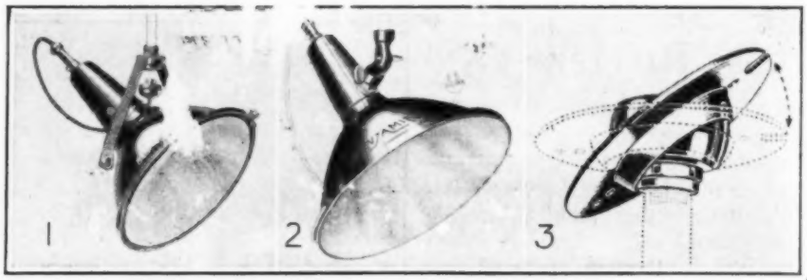


Fig. 2—Cross-sectional view of the nailer

Benjamin Industrial Lighting Fixtures

Three industrial lighting fixtures have been recently placed on the market by the Benjamin Electric Manufacturing Company, 120-128 South Sangamon St., Chicago, Ill. The Benjamin "Projectolite" is a special lighting unit designed for illuminating straight and rounded surfaces from an oblique angle. By means of a special lens in this fixture the powerful flood-light beam is flattened and broadened so as to direct a greater part of the light to a point farthest from the light source, and a correspondingly smaller portion to points nearest the reflector. Consequently this process of spreading the light rays results in an even illumination over the entire surface. This fixture is recommended for automobiles and car body spraying and finishing departments.

The Benjamin "Intensifier" is a supplementary lighting unit for spe-



Benjamin Industrial Lighting Fixtures
Left—"Projectolite," Center—"Intensifier," Right—Aligner

cial operations where, in addition to good general illumination, it is desirable to concentrate an intense light on certain small areas. With this lighting unit intensities of illumination range from 35 foot-candles up to 250 foot-candles, depending upon the wattage of lamps used. Because of the discrimination of detail permitted by the use of this fixture it is recommended for fine assembly, close inspection and for fine machine work, and for illuminating the surfaces of dies and similar precision operations.

The Benjamin 45-deg. aligner is a sturdy ball fixture aligner. This device is easily and quickly installed and is suitable for all industrial locations where the lighting fixtures are suspended directly from the outlet box. Even on an installation where the slope is as great as 45 deg. this aligner permits the fixture to hang plumb, and, in addition, because of the ball and socket design, the fixture is protected against jars and shocks.

Artisan "Junior" and "Master" Lathes

TWO models have recently been added to the line of lathes made by the Artisan Manufacturing Company, 859-861 Hathaway St., Cincinnati, Ohio. Both machines, which are known as the "Junior" bench lathe and "Master" engine lathe respectively, are equipped with standard features of the line such as headstock, tailstock, carriage and screw-cutting unit. Because of these interchangeable features of the various units these machines may be equipped with either plain- or compound-rest, hand feed and either loose or quick-change gears.

The "Junior" bench lathe, shown in Fig. 1, has a unique motor-drive unit. A shelf is cast integral with the bed. The countershaft unit is mounted on this shelf and is regularly supplied with the machine whether belt or motor driven. When motor-driven a ¼-hp. motor is mounted on the shelf and belted to the tight and loose pulleys on the countershaft above. The machine has a swing of 11-in. and a distance between centers of 18 inches.

The "Master" engine lathe, shown in Fig. 2, has a simple and efficient motor-driven unit. The countershaft forms a part of the machine whether belt- or motor-driven and is mounted as shown in the illustration of the rear view, Fig. 3. A ½-hp. motor is furnished for the motor drive and is mounted on a sliding base within the cabinet leg and belted to the friction-clutch pulley on the countershaft. The sliding-motor base affords a means to take up any belt stretch. A sheet-metal apron is fastened within the cabinet leg and extends over the countershaft to prevent chips from falling on the friction clutch and other working parts. The machine is built with 11-in. swing and has a distance of 36 in. between centers. It is furnished with a compound rest.

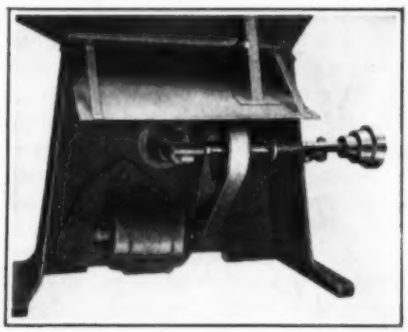


Fig. 3—Arrangement of motor-driven countershaft for the "Master" engine lathe

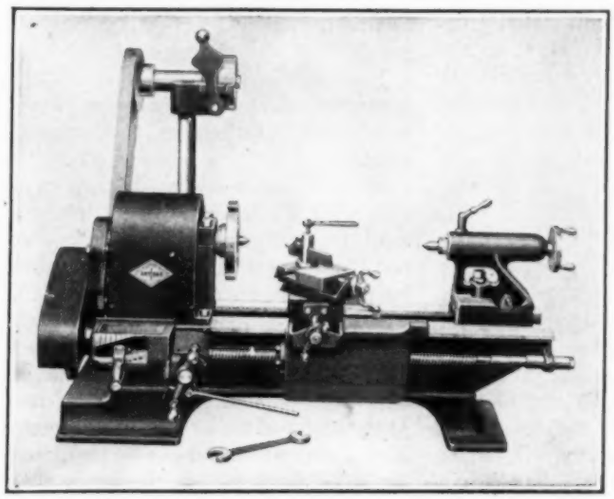


Fig. 1—"Junior" Bench Lathe

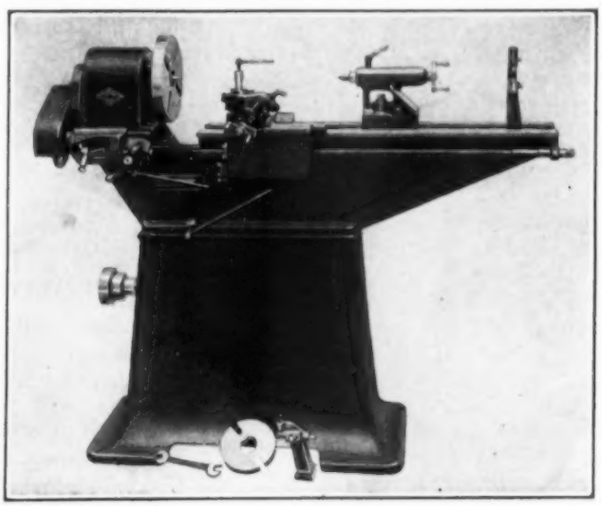


Fig. 2—"Master" Engine Lathe

Hanna Single-Purpose Riveters

TO MEET the demand for special equipment the Hanna Engineering Works, Chicago, Illinois, has developed two single-purpose riveters; a push-type chassis-frame riveter, and a tractor-wheel riveter. Both machines are pneumatically operated for cold riveting. Simplicity and ruggedness sufficient to insure continuous operation are claimed by the manufacturers.

The chassis-frame riveter, Fig. 1, drives the horizontal rivets which secure the chassis-frame cross members to the web of the side bar as well as the rivets which secure step-hanger brackets to the chassis frame. The inner, or stationary nose, is C-shaped to hook over the flange of the side bar which operation is facilitated by the provision for tilting the rivet-driving mechanism above the horizontal axis of the dies. This mechanism may also be rotated upon a vertical axis, which, with the cross travel provided, permits riveting on both sides of the chassis frame as it passes through the riveting line. The riveter has a reach of 3 in., a 7-in. gap, and a 2½-in. die stroke. It is available in 15 and 20 tons capacity for driving $\frac{5}{16}$ or $\frac{3}{8}$-in. rivets cold.

The pneumatic tractor-wheel riveter shown in Fig. 2 cold heads two $\frac{3}{8}$-in. rivets, which secure the spoke to the rim with each stroke. It is adjustable for tractor wheels from 32 to 56 in. in diameter. The rivet-driving unit is the Hanna pneumatic toggle and lever mechanism. The toggles close the gap between the riveting dies with little air consumption while the lever exerts uniform tonnage on the dies through a considerable portion of the die stroke, regardless of variation in thickness of the work. Rivets are inserted from above and headed from below, an air-actuated elevating device nesting the manufactured heads of the rivets in the upper die.

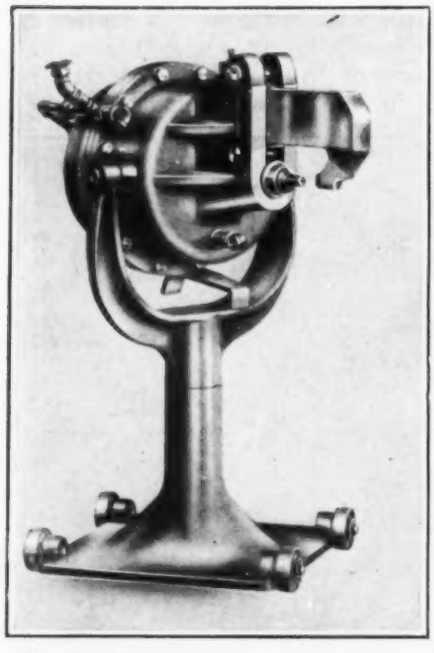


Fig. 1—Hanna Push-Type Pneumatic Chassis-Frame Riveter

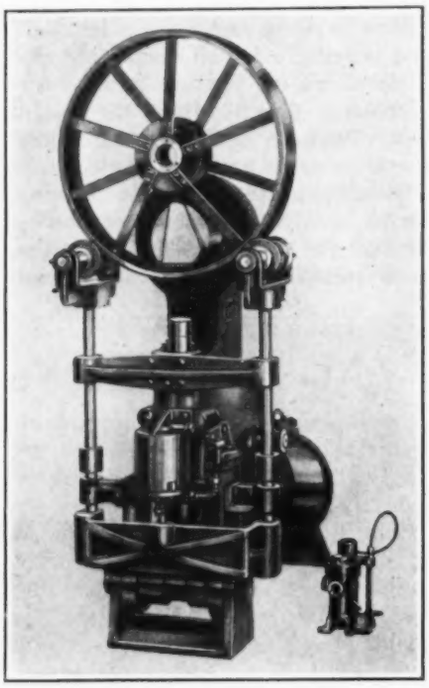
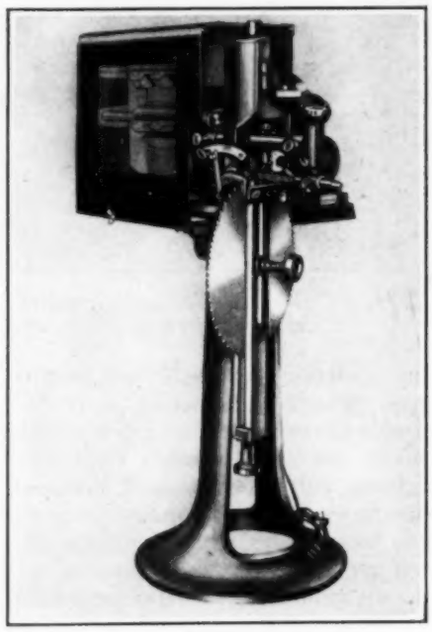


Fig. 2—Hanna Pneumatic Tractor-Wheel Riveter

Wardwell Model F, Double-Acting Circular Saw Filer

So that circular cross-cut saws and rip saws may be filed in the direction in which the teeth are set, the Model F, double-acting circular saw filer has been introduced by the Wardwell Manufacturing Company, Cleveland, Ohio. The machine will handle circular saws from 4 to 18 in. in diam., with teeth up to ½ in. from point to point. Teeth may be jointed and filed at the rate of 70 per minute. Cross-cut saws are automatically swiveled while each tooth is beveled to any amount of bevel from 0 to 40 degrees.



Wardwell Model F, Double-Acting Circular Saw Filer

To the main drive shaft running on Timken roller bearings at a speed of 70 r.p.m., is connected a twin cam which raises the vertical-side frame to an offset upward movement. This oblique movement is essential as it permits the file to enter or leave the tooth with a gentle finish to the slope, thus eliminating all burrs to a large degree. It also permits taking care of any hook of the tooth. Attached to this cam is an arm on the end of which is a steel roller that operates a horizontal-slide filing arm. This horizontal-slide arm works on heavy steel rods attached to the vertical slide.

From the main drive shaft, a steel cam with a hardened roller drives a steel frame held between slides. A rod from this steel frame is connected by two gears to the swiveling head. To this swiveling head a saw vise is attached. The cross-cut saw is turned alternately right or left an amount which depends on the number of degrees of bevel to be given the teeth. This amount of bevel can be regulated by an adjustment on the cams that move this mechanism. When rip saws are sharpened, this movement is

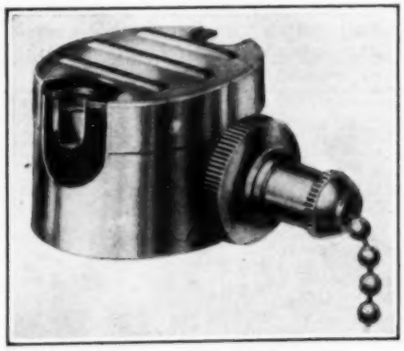
thrown out of action. The cross-cut saw is centered below the file by a gage which moves the back-vise jaw in or out. This gage has a lever with a marker moving over a segment, and saws of similar gages may be marked on this segment.

An automatic tightener grips the saw during the file stroke and releases it as the filing arm raises. The saw can be raised or lowered so that a heavier or lighter cut can be taken without changing the adjustment of the file. The file is held by holders that permit moving it in any direction. Two adjustments cover the movements of the feed pawl lever which is attached to the swiveling head and is rocked by a riding rod in contact with the hardened inserted-steel strip on the filing arm.

The machine makes use of standard double-end taper files and is furnished with a ¼-hp., 1,750-r.p.m., single-phase, a.c. or d.c. motor. The motor is direct-connected. A cord is furnished for connection to a lamp socket and a starting switch is placed at the front of the machine.

"Levolier" Fixture Switch

After a long period of field trials under actual working conditions, the McGill Manufacturing Company, Valparaiso, Ind., has announced an improvement in the "Levolier" No. 61



"Levolier" Fixture Switch

fixture switch which is used for industrial lighting, assembly halls and gymnasiums, where the tendency now is toward the use of higher wattages and where the two most essential requirements are individual control of units and reliable operation.

It is claimed by the manufacturers that the use of this switch saves on run of conduit from the outlet box to the switch and saves a wall switch and the labor of installation. The actual size is $1\frac{3}{4}$x$\frac{7}{8}$ in. and is therefore suitable for shallow ceiling pans and canopies. All of the current-carrying parts are of heavy section, and the make and break is so designed that arcing effect is minimized. This switch will take the initial destructive surge of a cold 500-watt gas-filled Mazda lamp and will stand up in continuous service over long periods of time, it is claimed.

"Union" Motor-in-Head Speed Lathe

Speed lathes with the motor built into the head have been presented by the Gallmeyer & Livingston Company, Grand Rapids, Mich. The machine is built in three sizes and may be equipped with one-, two or three-phase, a.c. or 115- or 230-volt, d.c. ½-hp. ball-bearing motors. The speed may be either 1,725 or 3,450 r.p.m. at the spindle. The motors are interchangeable, so that in a few minutes the slow-speed motor can be replaced with a high-speed motor.

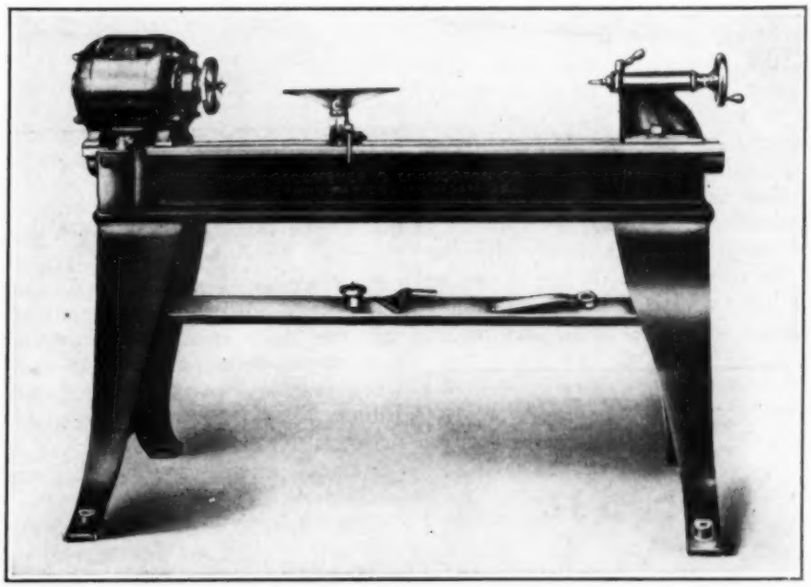
The beds furnished with these three sizes of motor-in-head speed lathes are 4 ft. 2 in., 5 ft. 4 in. and 6 ft. 4 in. long, cast in one piece and machined the entire length. The machines will swing work 26, 40 and 52 in., respectively, between centers. The height to the top of the bed is 36 in., and the distance from the bed to the center is 6 in. The machines will handle work up to 12 in. in diameter over the bed and up to 9½ in. over the tool rest. Heavy cast legs provide a rigid support to the bed, eliminating all vibration, and a shelf is located below the bed in a convenient position.

These machines are equipped with a rigidly- and accurately-constructed tailstock which may be located in position or released from its fixed position by a half-turn of a special wrench. The tailstock spindle is $1\frac{5}{16}$ in. in diameter, bored for No. 2 Morse taper. Adjustments are made by means of a conveniently-located handwheel, and the spindle is held rigidly in place by a quarter-turn of the lever provided for this purpose. The tool rest is adjustable vertically to and from the work, and it swings at any desired angle.

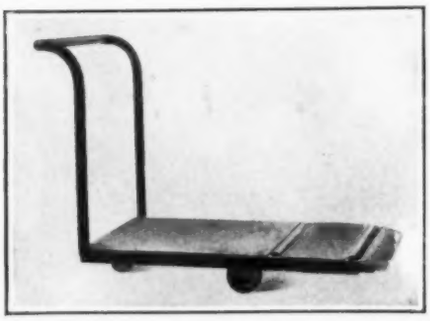
Lyon Utility Truck

Features claimed by the Lyon Iron Works, Greene, N. Y., for its utility truck now in manufacture are: Ease both in loading and in unloading due to low height; tilting easily accomplished to push the special nose under packages; and rolls built into the platform to facilitate loading and unloading. These trucks are applicable for moving tote boxes of crated machinery. It is desirable to have rolls under such objects.

The truck is made with a platform



"Union" Motor-In-Head Speed Lathe

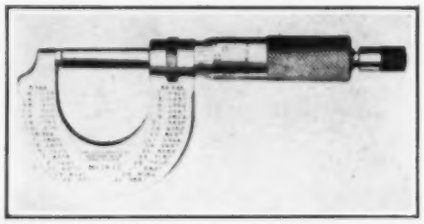


Lyon Utility Truck

22x32½ in. which is 5 in. above the floor. The nose has a length of 3 in. and is made of ¼-in. steel plate. The size of the rolls is 1⅝ in. outside diameter. The frame is made of 1½x1½x $\frac{3}{16}$-in. angle, having three cross-braces of the same material which also form supports for the casters. The top plates are 10-gage steel fastened to the frame. The handle, which is 30 in. above the floor, is made purposely low to enable operators to reach over the handle when desired in loading. The truck was designed for a nominal capacity of 500 lb. It is sufficiently strong to carry loads in excess of this, but the small wheels used make this difficult. The weight of the unit is 100 pounds.

Lufkin Rapid-Reading Micrometer

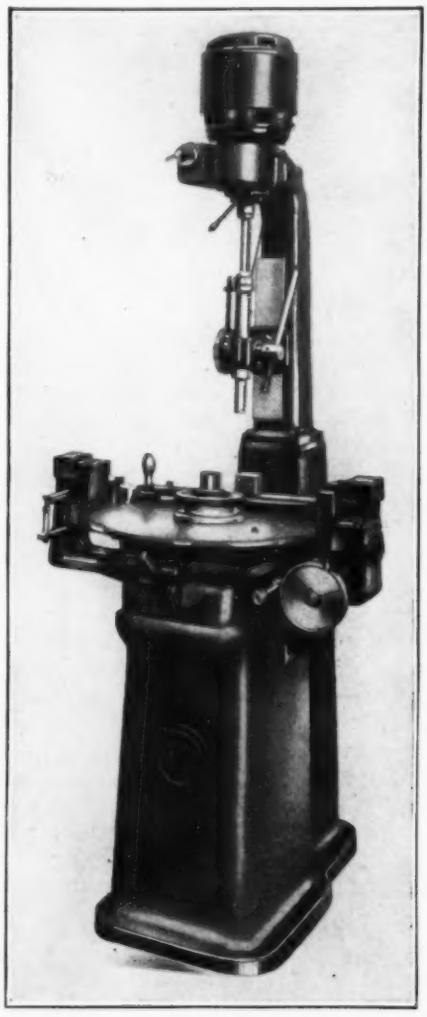
A feature brought out by the Lufkin Rule Company, Saginaw, Mich., is that of rapid-reading graduations on micrometers. Instead of numbering every five thousandths of the sleeve on the tool, each thousandth is numbered consecutively up to twenty-five, with every five-thousandths number showing more prominently. This simplifies the reading and assists very much in eliminating mistakes, as it is only necessary to add the figure showing at the reading line on the sleeve, to the last twenty-five thousandths line showing on the hub of the micrometer.



Lufkin Rapid Reading Micrometer

Gisholt 12-, 24- and 36-Inch Static Balancers

Static balancers in 12-, 24- and 36-in. sizes have been announced by the Gisholt Machine Company, Madison, Wis. Certain mechanical features



Gisholt 24-Inch Static Balancer

have been added since the introduction of the 18-in. machine which was described on page 557, Vol. 66, of the *American Machinist*. A lead screw has been provided for adjusting the drill spindle for drilling balancing corrections at various radii when various parts are handled. Either belt drive or direct-motor drive on the drill spindle which is of ½-in. or 1-in. drill size capacity are available.

The 12-in. machine is very sensitive and is designed for service on small high-speed light work such as clutch parts, small fans and small flywheels containing magneto magnets. This machine provides sufficient sensitivity to detect very small amounts of unbalance of such pieces.

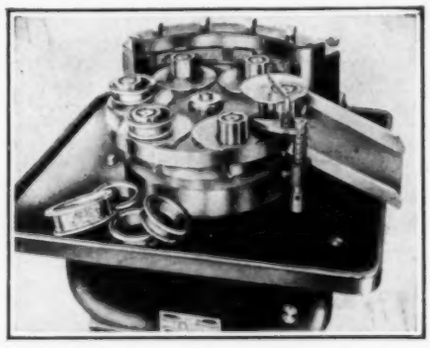
The 24- and 36-in. machines handle large flywheels, heavy grinding wheels, and other large-diameter, narrow-faced parts. They are sufficiently rugged to support the heavy weights met in their size ranges.

Noble & Westbrook Rapid-Marking Machine

An extra large die-holder carrying four marking dies is the feature of the rapid-production marking machine which has been announced by the Noble & Westbrook Manufacturing Company, Hartford, Conn. Marking at four different locations on the same ring is possible. This marking equipment is made similar to that of the No. 24 machine, which was described on page 228, Vol. 66, of the *American Machinist*.

The parts to be marked are placed on the stations or pins as shown on the dial. The dial revolves continuously and carries the parts to the marking die where they are marked and then unloaded automatically. The only requirement of the operator is to place the parts on the stations as the dial revolves. The revolving dial is very rugged, being driven by a worm and gear which runs continuously in an oil bath.

This style machine will mark various tubular parts made of thin



Noble & Westbrook Rapid-Marking Machine

materials without distortion. A production of 100 pieces per min. can be obtained, depending upon the size of the parts and the speed of the operator. The machine is motor-driven and is self-contained and weighs approximately 425 pounds.

NEWS OF THE WEEK

Broad Appraisal Necessary to Gage Present Business Trend

Limited statistics too likely to be misinterpreted

By JULIUS KLEIN

Director, Bureau of Foreign and Domestic Commerce

IN ESTIMATING the present situation there seems to be a prevailing tendency simply to take statistical soundings as to the depth of the business stream at random spots, with only an occasional effort to gage the force and direction of its current, its general trend, whence it has come and whither it is carrying our commercial and industrial crafts—and at what speed. After all, the outstanding feature of our business life is its extreme mobility. Any attempt to depict such a dynamic force requires—to change the figure—a motion picture projector, rather than a photograph. Our statistical magicians are all too fond of bewildering us with a terrifying kaleidoscopic whirl of digits, which at best afford only a momentary impression of the situation—a single segment of the film and none of its sequence which, after all, really indicates what the ordinary merchant or manufacturer is longing to get, namely, the *drift* of the action.

He does not expect any miracles of prophecy; in fact, he has a suspicion that one of the most brazenly profitable businesses of this day of narrowing margins is that of "propheteering." If he has been so wickedly academic in his business thinking as to check over the accuracy of past performances of several of these seers, he probably has a suspicion that over a long period of years their prognostications are about fifty per cent accurate, which means that he can achieve almost the same results by flipping a coin. Now, this is far from any intention to discredit the admirable efforts of many substantial statistical agencies, but their recent widely divergent appraisals of the business outlook and the unemployment situation, particularly, have so puzzled the average business man that he wonders whether any of it is really worth while, in terms of ordinary commercial utility.

The type of queries as to current conditions which are now coming to the Department of Commerce—and our inquirers now number 10,300 a day on the average—indicate certain definite shortcomings of our present business statistical apparatus. In the first place, there is entirely too much of it; at least the average merchant or industrialist who hasn't a staff of business analysts in his own business organization seems to think so. He feels the necessity of having segregated for him a few outstanding figures of prime utility for his purposes. This task of selection is clearly one in which his trade association and business papers can be of immediate and special help. The business community no longer wants "bigger statistics," but better ones.

Secondly, our correspondents complain of a persistent tendency to overwork available figures. To cite a specific example, it has been clearly demonstrated that much of the anxiety and confusion incident to the recent uncertainty in some circles as to the outlook was due to the application of December figures to March conditions. The 1927 totals in many lines have just become available for detailed analysis and the deductions therefrom have been more or less unconsciously applied to current conditions, to which, however, they are by no means necessarily pertinent.

> **"Broadly speaking, there are just a few outstanding figures which for current average use seem to be of special value. . . The trend of electrical energy consumption offers a definite gage in a wide range of industries. . . Another figure which seems to be getting wider currency, is that of building contracts, as distinguished from building permits. . . Inventories are also being more widely used as a ready clue to the actual mobility of demand. . . Two commodity figures are the trends in consumption of machine tools and office appliances. . . In addition, there are, of course, the basic factors of the availability of credit and the conditions in such major industries as automobiles and steel."**

Thirdly, on the major problem of unemployment, we are clearly behind Europe in the accuracy of our statistical data. True, there is a special and not altogether favorable explanation of the superiority of Old World figures, namely, the prevalence of doles and other forms of subsidy to the unemployed. In any event, it is most gratifying that the Department of Labor has undertaken an authoritative study and it is hoped that it may lead to a systematic check of this highly important problem. Certainly the samplings that are thus far available indicate the gross unreliability of the wild guesses that have been made by various partisan agencies.

A characteristic instance was in the case of the Baltimore figures, which were given at the outset as 70,000 by one group of advocates, subsequently as 36,000 by another agency, whereas the actual house-to-house count by the Department of Labor revealed only 17,000. It is obviously futile to deny the existence of unemployment and even its conspicuous prevalence in certain districts, such as New York, Cleveland, the textile towns of New England, and Philadelphia. There has been undoubted misrepresentation in both directions by opposing groups of partisans. We must clearly have, however, some reliable yardstick for this highly important factor.

A fourth weakness in our business figures, as currently interpreted, has been revealed in miscalculations in some quarters based upon the returns from chain stores and mail order houses. The increasing gross returns from these sources has been taken to indicate improved buying power in spite of the clearly evident factor that in each case the number of stores involved has been notably increased. If deductions are made for this factor, the returns in the main do not indicate any *relative* increases in business. In other words, the increase in the number of chain stores and the new departure of mail order establishments in branching out into retailing have clearly resulted in the displacement of existing "independent" stores, at least so far as the present available figures indicate.

ALLOWANCES SHOULD BE MADE

Misconceptions evident in the same queries coming to the Department indicate the necessity of pointing out still other minor discrepancies in current figures even though these weaknesses have already been repeatedly stressed in the business press. Comparisons of present car loadings with corresponding 1927 figures are obviously inadequate unless allowance is made for coal traffic. The temporary elimination of Ford operations must be borne in mind in calculating automobile figures. In comparison with pre-war values it cannot be too often stressed that price changes must be scrupulously observed. Data as to the number of individual failures are not apt to be very illuminating unless coupled with figures on the total liabilities involved.

Furthermore, much of the widespread clamoring about our over-capacity, the ability of our boot and shoe factories to

take care of domestic demand on a six months' operation, or our glass factories to supply all necessary window glass each year with seventeen days' output—such observations may or may not be valid, depending upon whether they are coupled with a reliable appraisal of the obsolescence of this supposed over-capacity machinery. One well-known trade journal has pointed out that in a single group of machinery plants, forty-four per cent of the equipment is more than ten years old, which puts it back in the dark ages before the bewildering post-war technical advances.

Broadly speaking, there are just a few outstanding figures which for current average use seem to be of special value. It might be well to enumerate these without endeavoring to establish any priority among them, much less to suggest that the list is entirely inclusive. The trend of electrical energy consumption offers a decline gage in a wide range of industries. Incidentally, the February figures, as tabulated by the McGraw-Hill Company, indicate a substantial increase over February of last year for every industrial group with the exception of lumber. In some cases, the gain is unusually high—nearly 42 per cent in the case of rubber, nearly 40 per cent in automobiles, nearly 29 per cent in stone, clay and glass, over 26 per cent in metal working plants, 21 per cent in rolling mills and steel plants, and 18.5 per cent in chemical and allied products.

Building Contracts a Gage

Another figure, which seems to be getting wider currency, is that of the Department of Commerce on building contracts, as distinguished from simply permits, which are, of course, not in every case a definite indication of constructive action. Here again the figures are encouraging, running ten per cent higher during the first ten weeks of 1928 as compared with a year ago. Indeed in residential building the figures of the first two months of this year are 32 per cent over 1927. This situation is already being definitely reflected in the increasing demand for building trades labor and a wide range of construction materials throughout the country.

Inventories are also being more and more widely used as a ready clue to the actual mobility of demand. Here, the situation in mid-March is not at all discouraging. In general, stocks on hand are slightly lower than a year ago, the decline being heaviest in raw foodstuffs, which staples are apparently moving better than in early 1927, while inventories of manufactured commodities are slightly (about 8 per cent) higher. Of course, from the point of view of the manufacturer the increasing tendency toward hand-to-mouth buying, which is in part the explanation for the prevailing favorable low position of inventories, is not altogether an attractive indicator. He feels that he is being made to bear the brunt of the risk of stock maintenance, especially in many lines wherein the style factor enters.

Two commodity figures, which are less widely used, but which offer attractive possibilities as definite indicators are the trends in consumption of machine tools and of office appliances. These are both rather definite indices of the readiness of the manufacturer and merchant to back up their judgment as to the outlook with concrete preparations. It is significant that gross orders for machine tools in February, 1928, stood at 175.4 (the index 100 being the monthly average of the years 1922-24, inclusive), whereas February, 1927, registered 142.9. In the same broad group, foundry equipment orders have been running at substantially higher figures than last year. Office appliance sales for the first two months of 1928 were 10.5 per cent over the same period in 1927, with prospects described almost uniformly throughout the trade as "very promising."

Basic Factors

In addition to these factors there are, of course, the basic ones of the availability of credit and the conditions in such major industries as automobiles and steel. On the whole, interest rates, though not quite as low as during the middle months of 1927, are still reasonable and cheap money is, therefore, serving to relieve meritorious cases in the present situation. Automobile production, exclusive of the Ford operations, is now more than 33 per cent over figures for the corresponding period of 1927. The export markets are looming up as an invaluable factor in the general advance of this industry. Preliminary figures for February, 1928, total $36,557,726, as compared with $32,265,148 for February, 1927, and $30,349,822 for January, 1927.

March operations in iron and steel continued at the February rate of 85 per cent compared with 91 per cent a year ago. Price advances are being maintained and the prospects continue favorable. February steel ingot production was the greatest for that month in the history of the industry. Furthermore, the exports for the first ten weeks of 1928 were 30 per cent over those of the previous year.

In fact, it is significant in both of these major industries of automotive products and iron and steel that they have in each case made notable advances in their export programs, not only as to volume of trade, but particularly in the steadily improving thoroughness of arrangements and in their continued assurance of superiority in dealing with European competition, even though in the case of iron and steel it be enforced by a spectacular, though not entirely successful, international cartel.

The trend of our imports is also being noted by competent observers as a useful index of the growing demand for raw materials on the part of our industries, and of the evident appraisal of our importers of the country's requirements for foreign luxury and semi-luxury wares, which today comprise so substantial a percentage of our total overseas purchases. February imports exceeded $353,000,000, which was 13.5 per cent larger than February, 1927, though, of course, it must be remembered that there was one more day in the month this year. Even so, there was a very substantial net per diem increase, due particularly to pronounced larger volumes of purchases of silk, coffee, and rubber.

With reference to the unemployment situation, precise figures are not available at this writing, but preliminary indications are that the totals revealed on the basis of accurate samplings now being taken in various districts will be very materially below the estimates of recent weeks. As Secretary Davis quite properly pointed out, three-quarters of a million, even a million, unemployed might be regarded as a more or less normal feature of any such vast industrial area as the United States, particularly at this seasonal turn of the year. Our real objective should be the elimination of surplus *employable* labor.

Much of the recent situation was quite evidently seasonal, and even more of it was sharply regional. The tendency of all too many casual observers was to generalize on the basis of momentary local observations, especially those around a few unfavorable spots on the middle Atlantic seaboard. Fortunately our industrial system, as indicated above, is not a permanently balanced and firmly stabilized organism, which can be slid under the microscope of statistical observers and scrutinized with prolonged deliberation. Fundamental variations are constantly going on, not only as among different regions at any one time, but also in any one region over a period of seasons. This obvious truism seems to have been overlooked by some current observers.

In these processes of flux and change, industry is subject to a number of resultant readjustments, and labor, unfortunately, suffers through its inability to maintain a sufficient fluidity from one region or industry to another.

Problem of Seasonal Idleness

The shrewdest perception of our most erudite counsellors has revealed no one panacea for this situation, not even the rigid maintenance of a high wage scale. Invaluable though that factor is as a rule, it can on occasions be carried to disastrous extremes. One of the most helpful contributions toward the alleviation of this regrettable accompaniment of every profound industrial evolution such as ours, was that recommended by Secretary Hoover at the time of the Unemployment Conference in 1921. At that time he urged the "accurate study by civic bodies of the character of the industries in their respective centers in an endeavor to discover opportunities for integrating industries to intermesh with each other in the reduction of seasonal idleness. Every city in the United States would be well advised in the interest of its own development to consider its industries with a view to a determination of those which might induce them to take up the slack in any seasonal employment of each other's existing establishments." This program is already well under way

In certain areas, for example in New England, and has given indications of helpful results.

Another corrective which is now very much to the fore is the allocation of public works to the slump periods in the employment curve. According to the Secretary, it was calculated in the case of the 1921-22 depression, that if we could have secured a delay of such undertakings to the amount of one-tenth during the period of normal business in the great utilities and construction works under the control of the Government, it would have almost planed out the depression in unemployment.

One of the inevitable costs of our progress in waste elimination and in more efficient protective methods has been the displacement of labor. In the automobile industry, for example, each employee is now turning out 11.5 units (cars, trucks, etc.) a year, as against 7.2 in 1913. In other words, the need for labor in that industry has decreased more than 50 per cent in ratio to the output. This development, plus the deflation of our wartime industrial abnormality, has resulted in a net decrease in employees in our factories of something like 917,000 since 1920. This substantial figure, if added to the 800,000 represented in the decline of employees in agriculture and the 240,000 relieved from the railroads since the War, gives a formidable total of displaced labor of nearly two millions.

Shift to Service Work

If our observation were to stop at that point—and, unfortunately, several recent commentators have been so overwhelmed with that figure that their emotion has not permitted them to go any farther, the business of the country would be indeed in a grave situation. There has, however, been a most helpful corrective, which has taken up most, though perhaps not all, of the slack, namely the astonishing increase in nonmanufacturing pursuits. For example, since 1920 there has been an increase in the number of workers in automobile servicing and distribution of nearly 760,000. There are nearly 100,000 more insurance agents clamoring at our doors today than in 1919. Another 100,000 increase is estimated in the service employees of electric refrigeration, light and power, and oil heating establishments. The management, servicing, and general direction of construction accounts for an increase of another 100,000 in the same time. There are 232,000 more teachers and professors required to look after the flaming youth of the present day than in 1919. The increase in motion picture servitors, exclusive of production, accounts for another 125,000 added to the pay rolls of that exuberant industry since the War. It is not hard to explain the increase of 170,000 barbers and hairdressers during the same time. One of the most impressive figures is that in the service branches of hotels and restaurants, whose personnel has increased by 525,000; some observers in the industry estimate nearly one million.

These are but fragmentary data, many of them based upon decidedly rough estimates, but they are quite sufficient to indicate that the net increase of employment in distribution and servicing functions is sufficient to balance the decrease in the three great groups of manufacturing, agriculture, and railroads.

All of this is offered as by no means an attempt to dispute the perfectly evident fact that there is unemployment, perhaps in greater quantity today than for some months past. It is offered solely as one phase of the employment situation which is apt to be overlooked, and without which any observations upon the over-capacity of industries, or the alarming deflation of our factory pay rolls through greater efficiency, simply cannot be properly understood.

After all, the chief factor in meeting this problem of industrial readjustment is not one of wildly searching for nostrums and panaceas, for laws and still more laws to pile upon the thousands that are reeled out on a mass production basis by our statute mills each year. The first and indispensable safeguard of our prosperity is to minimize waste, to concentrate every possible individual exertion toward widening the present rather narrow margin of profit by cutting in on production cost on the one hand and the expenses of distribution on the other.

Much has been done in the former; our chief task in the future seems to lie in further economies in distributive effort. The volume of output, however, economically achieved, is of no ultimate value whatsoever in our operations without a corresponding volume of profit to the manufacturer.

Compulsory Operation of Italian Metal-Working Plants to Reduce Imports

Mussolini lines up Nation's resources and outlets

ITALY is seeking to reduce imports of iron and steel and metal manufactures to the lowest possible limit. The government has just convened a council to discuss ways and means. It is complained that the Italian iron and steel transforming industries are passing up raw and semi-raw home product for that which is imported, while Italian blast furnaces and steel works, through their sales consortium, are offering their production at prices which leave but little profit.

To thwart the possible untoward consequences, another reunion was called between the Italian Ministry of Corporations, representatives of the General Industrial Federation and the Workers' Syndicates. As a result, a pact has been arrived at compelling compulsory operation of all correlated iron and steel and metal transforming industries. The agreement provides for the apportionment of various processes of transformation of iron and steel into distinct classes, wherein each plant will henceforth produce only its own specialty.

The various divisions are: Machinery and metal manufactures, shipbuilding, foundry industry, raw and semi-finished products. Prescriptions referring to wages, workmen's insurance, hours of labor, laying off and discharging of employees form the pact's chief clauses.

Wages are to be revised and stabilized but reductions may not exceed 20 per cent of the wage scale in force during the last trimestre of 1927. Hours of labor will be 48 a week with two extra hours a day compulsory on demand of the employer; the worker also is bound to accept a reduction of two hours per day if operating conditions make it desirable that the plant shall be thus conducted. In case of illness the worker's place shall be held for him for three months. All absence from work must have a justifiable excuse and where such is not forthcoming, or is not acceptible, the worker will be subject to a fine.

This clarifies the atmosphere or at least is an attempt to keep the Italian metallurgical industry as far as possible nationalized and protected and the *lira* partially sheltered from attack from beyond the frontiers. Italian imports in 1927 were actually three and a half billion *lire* less than in 1926, which, taking exports into consideration, brought the trading deficit down from above 7 billion *lire* in 1926 to less than 5 billion *lire* last year.

A year ago iron and steel importations were at a relatively high figure, but curiously it is only within the past few months that the Italian industry began to feel the effects. The government had even lifted the embargo on the exploitation of Italian iron mines which hitherto had been restricted in view of reserving them for any unforeseen political or economic situation which might arise.

The present disaggregation in the sales consortium of iron and steel producers was brought about by various big output plants which sought business at prices below those imposed by the consortium. Certain firms of lesser importance protested that even the prices set by the consortium were unprofitable and brought nothing above production costs to them. The Italian transforming industries did not respond to the suggestion of the government in its first conference and the situation is at a standstill.

The situation is not considered as being based on either a matter of price or quality. The commission agreed that Italian pig iron was excellent and susceptible of meeting any demands which might be made upon it by Italian founders save with the possible exception of a high phosphorous content. It was especially stated that the furnaces of Piombino and Servola could supply

a quality product that American, British and German iron masters might envy.

The fundamental Mussolini policy is all a matter of lining up national resources and outlets—the producer with the consumer—to the end that a strong nationalism might be the chief factor of the nation's prosperity. At the same time it was emphatically stated that the policy is not one of a tariff aggressiveness against the foreigner, chiefly for the reason that Italy is seeking foreign capital interests and wishes to alienate no one.

Italy may still be subservient in part to foreign influences in her purchases abroad but at the same time does not intend to lose her grip on her growing export trade in heavy lines. For 200 million *lire* of electro-mechanical goods bought abroad she still finds a foreign market for her own similar product to the extent of 70 million *lire*. The showing is creditable,

Italy's consumption of electrical goods increased in value from the equivalent of 42 cents a head in 1913 to $1.03 in 1926, a greater proportionate increase than is observed with respect to any other European country. Italy in 1913 was a buyer of electrical goods of exporting countries to the extent of 5.1 per cent of the world's total exports, while Italian production stood at 3.9 per cent of the total world production.

Import of dynamos dropped from 36.7 per cent of total world exports to 20.7 in the period indicated. Export of dynamos was 24.2 per cent of local production and of cable and wire 68.4 per cent in 1913 and reached 36 per cent for the former though dropping to 32 per cent for the latter in 1925. Probably this is because of the interior development in electrification in Italy itself, which naturally drew its supplies so far as possible from home sources.

In 1913 Italy's part of world export commerce in electrical machinery was 7.1 per cent but fell to 3.6 per cent in 1925. Cable and wire fell from 3.6 to 0.6 per cent. Italy has 5 per cent of the world's electrical generating plants, about the same percentage as Great Britain, a trifle less than France and double that of Switzerland, which is the most nearly completely electrified country in Europe. Investment in electric generating plants in Italy has grown steadily from 559 million *lire* in 1914 to 6½ billion *lire* last year.

Italy's pig iron production stands at the index figure of 156 as compared with the pre-war base of 100. The steel index is 179. The memorandum of the iron and steel industry issued by the League of Nations at Geneva gives the iron index figure for Europe entire as 91 and for steel at 114. Consumption of scrap iron has increased from 326,000 metric tons in 1913 to 958,000 in 1926, the larger part being imported from France.

Italy's percentage of pig iron compared to that of world production was 0.55 per cent in 1913 and 0.66 in 1926 and of steel 1.22 and 1.82 per cent respectively. Iron and steel consumption per capita was 38 kilos in 1913 and 62 kilos in 1925. Italy imported iron and steel and manufactures thereof to the volume of 777,000 metric tons in 1926 in excess of her exports while in 1913 the excess of imports was but 491,000 tons.

French Industry Shows Upward Trend Despite Imminent Political Crisis

Scientific management methods gradually being adopted

By Our Paris Correspondent

JUST how far French prosperity figures may be depended upon is an open question. There have been few officially recognized unemployed recently, but with the present short day and short week, operating output in most metal lines by no means equals that of capacity.

It is probably true, as Leon Blum, the Socialist leader in the Chamber of Deputies puts it, that a crisis exists in French industry considered as a whole. This statement, however, brought a prompt reply from M. Poincarè to the effect that there was no country in Europe where industry was operating on nearly so full a time basis as in France. He cited particularly England, Germany, Italy and Russia as being far worse off. The debate may be taken with rather more than the proverbial grain of salt which ever faction one lines up. It is simply a preliminary barrage in the political election campaign which opens in a few weeks, until which time both productive industry and trading alike (save possibly with respect to export goods) will undoubtedly be expectant rather than material.

The scientific management movement is gaining ground. The Metallurgical and Machinery Syndicate of Manufacturers has already made much headway in inducing employers to make the greatest economic use of raw and semi-raw materials, to improve stock keeping methods, etc. Time checking systems are under investigation with a view to making suggestions for improvement, and the routing of materials through the plant and the matter of documentation are being studied.

The recent rise in railway freights is a heavy charge on industry. With metallurgical products and their transformations, the increase per ton on the base of a 250-kilometer rail haul as indicated in the following table is particularly so:

	Ton rate in francs	
	1914	1928
Nuts, bolts and nails....	17	187.30
Machinery	25.50	252.90
Rolling stock parts.....	17	187.30
Rough castings	12.75	187.30

Most items in metal lines carry increases of from eleven to fifteen times the pre-war rate whereas the co-efficient relation of gold and paper is virtually five to one.

Makers of agricultural machinery are actually asking for freight reductions on their product, when sold or shipped to purchasers or agents. They argue that the concession of 50 per cent on rates already allowed a farmer on machinery sent away for repair or returned to the renter, would be a still greater aid to the farmer if applied to new machines as well. The chief deduction to be made from this statement is the demonstration of the gradual close alliance which is being brought about between agriculture and industry. If carried to its logical end, this procedure will perhaps do as much as anything to mechanize the French farm, upon which eleven million people in the country depend directly for their livelihood. The farm market for machinery and modern tools of all kinds is virtually undeveloped and is ultimately due for a boom, it is felt certain.

Pressure from Engineers

The Union des Syndicats d'Ingenieurs Francais (which includes electrical, machine tool and highway specialists) has asked that the law of August 11, 1926, be strictly applied as to the employment of foreign engineers where it is possible that the place might be filled by a French engineer. With respect to one phase of rationalization, the organization went on record condemning "concentration which puts industry under the hegemony of financiers or banks who seek only immediate material profits to the suppression of the stimulent of competition." It argued further for measures being taken that would assure more direct methods of distribution between producer and consumer.

The automobile industry is feeling the effect of anticipated spring sales. Many old and tried *marques* have disappeared or slowed down before the big output campaigns of Citroen, Renault, Peugeot and Mathis. The old De Dion-Bouton firm is reorganizing and Hotchkiss, Panhard, Corre and Chenard appear to be holding their own so far as their comparatively limited output of what the French call the *"personelle"* car is concerned, by loud-pedaling the maxim, "quality not quantity." This slogan has been considerably discounted of late by the perfection of mass-production methods which the French manufacturer in most metal-working lines still largely taboos. Citroen has recently eliminated certain accessories included in his 1927 models. He has succeeded in cutting off three thousand francs from the former price. This does not, however, represent reduction in production costs *per se*.

The bolt and nut trades are finding a more normal traffic by the suppression of competitive price quoting. Orders are not all overpowering considering capacity but the trade is lining up. The struggle among screw manufacturers has entered into an international phase, but French manufacturers are quoting

competitive prices which are commanding some business.

Demands for pipe are light and prices are stationary. Joints and valves and like accessories are obtainable from German makers at prices which more than compete with the French output.

Building hardware is on a rising price scale but spring business is shaping up hopefully. Tool handles are practically wanting. Suitable wood is lacking in France, and foreign sources, Norway and perhaps Hungary, are looked to for supply. Prices for handles of wood and metal-working small tools are double what they were before the war.

General unemployment is less than for some time past in the metal trades and industries. There has been a pick-up in the stamping industries of the Ardennes. In South and Central France boiler hands are being sought. At Saint Etienne the cycle and accessory trades are dull. In the North there is a general increased activity in finished and semi-finished products and there is regular work, though not up to full capacity, in the machinery and tool industries and an approach to activity in rolling-stock plants.

In the Paris district qualified metal workers in many correlated lines are lacking. Electrical machinery, the automobile and aviation industries are tending to improve their positions. The important Société Alsacienne de Constructions Mecaniques has concluded an arrangement for a "community of interests" with the French Thomson-Houston Company.

Imports Fall Off

Final figures show that total imports of machinery and manufactured metals from all countries during the last calendar year reached a value of 1,650,978,000 francs with a bulk of 145,569 metric tons, which was a falling off of rather more than 40,000 tons from the year before. Exports of like goods attained a value of 4,007,170,000 francs with a bulk of 1,216,437 tons, a notable increase in this case of more than a million tons.

By comparison these export and import figures are remarkable. It is the first time that French exports in these lines have reached so great a figure. It is shown, however, that imports of lead, copper, zinc and tin in the raw fell off during the year rather more than 50 per cent in value while exports of pig iron and merchant iron and steel, in value, stood about where they did in 1926. This situation demonstrates at least the progress France has made in the production of manufactured metal goods. To the figures above should be added an export value of automobiles for 1,960,010,000 francs. This figure, at the same time connotes a drop of a hundred million francs from the valuation of the year before. Switzerland, Germany, Spain, Belgium-Luxembourg and Great Britain were the largest buyers of French automobiles, very few going to Italy where the trade has become largely nationalized.

Imports from Great Britain fell off 51,955,000 francs in value in 1927, from Germany 755,926,000 francs, from the United States 351,000,000 francs. The United States stood first in value however, with Great Britain second and Germany third.

Exports were greatest to Great Britain (more than a fifth of total export values) but showed a drop of 528,783,000 francs nevertheless. Belgium-Luxembourg stood second, also with a falling off of 1,833,625,000 francs. Germany was third with an increase of 2,028,267,000 francs. The United States stood fourth with a drop of 307,790,000 francs.

Export Credit Guaranty Scheme to Aid British Shippers

Sum of £26,000,000 now available for backing bills drawn on overseas importers

By Our London Correspondent

THE customary spring epidemic of commercial fairs has set in with its usual virulence and is extending over the Continent of Europe. As is usual the British Industries Fair was held simultaneously in two places, in the west of London and at Castle Bromwich, just outside Birmingham, anything of an engineering character being at the latter place. The interest and indeed the value of the fair from an engineering point of view has grown, and in particular the electrical engineering section has extended. But on account of the ban that is imposed by the Machine Tool Trades Association, machine tools were not adequately exhibited at Castle Bromwich. From the business point of view the results of both sections of the British fair was stated to be satisfactory. The attendances beat all records. The numbers of home and overseas buyers attending have been stated officially to be 103,586 in London and practically the same in Birmingham.

The next machine tool exhibition will be held in London from September 5 to 22. So far the number of exhibitors is about 90, of whom rather more than half are actual machine tool manufacturers, the rest being merchants or agents.

The British Industries Fair is held under the auspices of a government department, namely, the Board of Trade. But while this department is responsible for the London section, the Birmingham fair is organized and controlled by the local Chamber of Commerce, supported by other local bodies, the only government support actually afforded being a share of the sum of £25,000 set apart for publicity purposes.

Export Credit Guaranties

The government, through the Board of Trade, is endeavoring to help firms engaged in overseas trading, by means of an export credit guaranty scheme. This has now been in active operation for the better part of a year and is based on a sum of 26 million pounds that has been made available for the purpose of backing bills drawn on overseas importers up to the extent of 75 per cent. It covers all risks and applies to the export of British goods. The premium charged varies according to the circumstances, such as the country of the importer, his own standing and the length of credit given. For short credits, say three months, the average rate on a 50 per cent guaranty is about 15s. per cent, or 10s. per cent in the case of a British overseas dominion, the maximum being about £1 per cent. These figures apply more particularly to the textile trades. For engineering goods the rates would probably be higher, on account of the longer credit that has to be given. Recent figures are not available but at the beginning of the current year the sum thus guaranteed amounted to about one and one quarter million pounds, chiefly in respect of textiles.

Basic Industries Depressed

Not much that is outstanding can be reported regarding the main industries of Great Britain. Those that concern themselves with the home market and those tending towards luxury industries remain well placed, while the basic industries that were depressed are in no worse position. The machine tool industry shows but little change. The fact that it depends very largely on the automobile industry is still recognized and occasionally regretted, though one or two districts have reported better demands from other branches of engineering. How far the motor car influences these matters will be seen when it is stated that of the very few machine tool firms that of late years have extended their works, practically all are in the Midlands, which is the chief automobile manufacturing area. Some electrical firms have been making additions and are likely to make more; for it is estimated that, apart from other markets for these firms, within a relatively few years about 100 million pounds will be spent on electrical machinery in connection with the new national scheme for the supply of power just beginning to come into being. The total expenditure will probably be at least 2½ times the sum mentioned. Already a number of contracts have been given out.

The firm of Alfred Herbert, Ltd., has commenced the concentration of its manufacturing activities at Edgwick. The site available extends to 30 acres, the main machine shop itself extending over 7 acres.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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THE Stock Exchange boom continues to occupy the center of the stage, and the spotlight of newspaper publicity is making it visible to the whole world. At a cost of $45 for a three minute conversation many orders to buy American stocks have been telephoned to New York from Europe, and even Bombay and Calcutta have become participants in the wild whirl into which nearly the whole of America seems to have been drawn.

Stock Exchange memberships have sold at $335,000, with $500,000 predicted. The number of shares traded in has exceeded 3,000,000 daily for the past two weeks, and the machinery of the Exchange has been taxed on some occasions to give its customers the service they expect. "On with the dance, let joy be unconfined," describes the spirit which pervades the Wall Street region as well as the financial districts of most other American cities.

Fuel is being added to the flames by the consolidations of banks and industrial corporations that are reported almost daily, and the axiom that the whole is equal only to the sum of all its parts is flagrantly disregarded by those who rush to buy the newly created securities. The speculative urge is so strong and the infection so widespread that it is impossible to calculate upon its duration. All that can be said is to advise caution, for the end will come some time, and those left to hold the sack will find it heavy though empty.

But of the effect of the "stock boom" upon general business it is possible to speak a little more intelligently, and it must be admitted that all the evidence thus far available indicates that trade is being slowed down by the activity in the security markets. The reason for this is not far to seek. It is revealed in the conversation heard in commercial circles, where merchants are saying "go slow until the excitement in Wall Street is over." One result is that the distribution of merchandise has been checked and another is that everyone is trying to cut down commitments and stocks. This makes the commercial situation safe, but it limits sales and profits, for business once missed is not often recovered.

On the commodity exchanges it is much the same story. Speculation is dead and the only important price changes recorded have been due to some governmental action or report. This is particularly true of rubber, which has fluctuated sensationally upon rumors that the British government would or would not continue to regulate exports, and that the Dutch planters would form a selling organization to cope with the American buying pool, to which the banks have just extended another credit of $60,000,000.

WHAT'S DOING IN INDUSTRY

BUSINESS conditions in March have shown an erratic trend to date in that the index of prosperity has varied from week to week. In Philadelphia, for example, business has been relatively inactive, and in Buffalo it is felt that this month will show less business than in February. Here there is little movement in contractors' equipment, while in Milwaukee this field is very active and is furnishing a good source for machine tool orders. On the other hand, in Milwaukee buying from automobile manufacturers is not up to expectations, whereas in Detroit machine tool buying is at a high peak because of unprecedented automotive activity. Several automobile companies have exceeded all previous production records. Cleveland also feels the effect of this activity.

RAILROAD buying in Chicago is much improved, but in New England and in Philadelphia this field is quite inactive. In New York orders from this source are erratic in volume.

EVERYWHERE inquiries are in good volume, and a general spirit of optimism prevails, even where business at the moment is dull. Employment among skilled workers in the metal working plants is at a high level, contrary to daily press reports.

The upward movement in sugar has been halted by the fear that the Cuban government would sell 200,000 tons out of its reserved allotment and a relatively small advance in cotton is attributable to a census report which shows that the season's ginning was smaller than some expected. An advance in wheat and corn was about the only spontaneous price movement recorded during the week and it was not especially significant. Coffee continues to be stabilized by the Brazilian government, despite a large surplus on hand.

In the steel industry, the motor industry and the building trade it is much the same story. The volume of business might be called normal but it is below earlier expectations. Automobile production thus far is a little larger than for the same period last year, but there is some question whether sales are keeping pace and whether the more optimistic prophecies will be realized. And the iron and steel reviews admit uncertainty because unsteadiness in prices is apparent.

The available statistics are similarly inconclusive. Car loadings for the week ending March 10 were about 5½ per cent below 1927, but the decrease as usual was chiefly in the coal traffic. Brokers' loans increased $32,000,000 during the week, and with the advance in sterling exchange gold exports have been resumed on a moderate scale.

But none of these things shed any light on the future and the commercial stasis that prevails seems likely to continue until the stock market ceases to attract and distract the public. Just when and how the present excitement will be checked no one can say, but the trees never grow to the skies and that it will be ended some time is about the only thing that can be predicted with certainty.

But candor compels the admission that an ebb in the tide is not yet discernible for the spirit of speculation seems to be rising in England and France, and increased activity is reported on the London Stock Exchange and the Paris Bourse.

As usual in the case of such a world wide movement, a world wide explanation for it is sought, and credit inflation is again talked of as a reason for the present uplift. But the fact that commodities have not advanced along with securities makes it difficult to accept the inflationary theory and we are driven to the conclusion that America has become the victim of its own enthusiasm and that Europe is commencing to follow our example in capitalizing our hope of the future.

This is all very well, but we must be on our guard against looking too far ahead or attempting to capitalize a future that is beyond our ken, and it is against the illusion of a prescience that is impossible that we should protect ourselves at present.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

The great majority of the machine tool manufacturers of the Cincinnati district report that in the past week market conditions have improved in a manner that is most encouraging. While at this writing the month's sales have not been as large as some had hoped they would be, there is no discouragement among the trade; instead there is a feeling of satisfaction at the gain that has been made. A manufacturer of large tools reported that the past month, so far, has been much better from a sales standpoint than the same period of last year.

Sales agents report that the local market is dull but take courage from the fact that much business is pending, and the orders must be released soon, as the need is becoming greater day by day. General business is improving in this territory, it is pointed out, and this must be reflected in the machine tool industry very soon.

An increased number of the week's orders called for two or more tools, but the sustaining market feature was the sale of replacements and single tools. The principal buyers were general machinists and miscellaneous users, located in all parts of the country, whose purchases were well diversified in the matters of sizes and types. An increased amount of buying was done by concerns in the automotive industry and its allied lines.

The week's inquiries were large in number and well scattered geographically. The great majority of these came from general machinists and miscellaneous users and were in regard to single tools and replacements.

CLEVELAND

Increased activity is noted in the local machinery and machine tool market. Sales showed an increase in the past two weeks compared to the previous two weeks. Automobile manufacturers and accessory concerns are furnishing most of the present business. Orders from this source included several good-sized lists and an increased number of single tool and replacements. A wider range of buyers is also noted.

Various branches of the trade report that inquiries are increasing steadily. It is the general feeling that market conditions are getting better and the general expectations that the next few months will show continued gains in orders. The automatic machinery line is enjoying its best business of the year. Punch press, turret lathe and planer manufacturers are increasing their production schedules.

The Cleveland Board of Education will receive bids on April 16, for machinery and equipment for the new Alexander Hamilton Junior High School. This list will include more than twenty pieces.

PHILADELPHIA

While the machinery and machine tool market in Philadelphia was devoid of any sizable orders during the last two weeks, producers and dealers regard the situation as encouraging. This feeling was based upon inquiries received which bore hopeful indications for future orders and upon some replacement purchases by two Eastern railroads.

The Southern textile industry has made some inquiries regarding mill equipment from Philadelphia dealers, which is regarded as indicative of early purchases. So far as actual business is concerned most of the dealers reported their sales now are about the same as they were at this time last year. Dealers in woodworking equipment reported some buying from midwestern mills.

Engineering firms specializing in railroad equipment and repairs reported some business, but the situation was regarded as somewhat slower than at this time last year. All of the dealers regard the situation in the automotive industry as favorable with prospects of added business as the season advances.

MILWAUKEE

Trends in the machine tool market show little change, and a moderate volume of business is passing. It appears to be difficult for manufacturers of metalworking equipment to make gains, new business being spotty and still surrounded by an air of hesitation. Inquiry is active, however, and the impression prevails that the situation is undergoing improvement that will soon manifest itself. The effect of recent price advances has been mixed, for in some instances purchases have been postponed, while in others action toward buying has been more prompt.

Automobile factories as a group are not buying new equipment to the extent that was expected, although a number of concerns are in the market. Most of the effort of the industry seems to be in the direction of increasing production and minimizing man-power costs, and this process is throwing back on the market considerable machinery of value that can be resold only at ordinary used machine prices.

The power farm machinery industry continues to be a substantial tool market factor. Manufactures of machinery for building and highway construction are relatively active buyers, but the quantity of purchases by railroads is disappointing. Machine shop employment is holding its own at the recent peak and there is no surplus of skilled labor in this industry.

NEW ENGLAND

The current week has shown no change over last week in this territory. Business in the machinery and machine tool field, as a whole, has been less active during March than either January or February. Prospective business, judging from proposed construction in the industrial field, by outstanding inquiries from several sources, by the improvement in the metal working industry and by generally increased working schedules in several lines, is quite bright.

Orders placed for new machinery continue on a par with previous weeks in March. Representative of the demand were orders for 20- and 14-in. lathes, a boring mill, three drills of various sizes and several grinding units. Inquiries, if anything, were a little lighter.

Railroad buying is comparatively negligent in this territory, and the bulk of the business placed is from the automotive industry, electrical equipment, and aircraft builders. Providence, R. I., will equip a metal working department in connection with its school program. New England has several projects of this nature, namely in Bridgeport, Bristol, Hartford, Springfield, Westfield and Worcester.

DETROIT

Conditions in the machinery and machine tool market are a little uneven but generally speaking the dealers are enjoying a period of prosperity greater than at any time in many months. Most of the automobile plants are running at full speed and all of the body builders and all of the manufacturers associated with the automotive industry also are running at high speed.

This does not mean, however, that all of them are buying or that all are in the market for machinery or tools. As a matter of fact many are more or less thoroughly equipped but there is a constant demand for balancing up equipment as is always the case in a good production period. This is especially true now that most of the manufacturers have been carrying very little reserve machinery. Stocks had been badly depleted and most plants were carrying only barely enough for immediate needs, which in the past 18 months have not been great.

Cadillac, Packard, LaSalle, Oakland, Graham-Paige, Dodge, Oldsmobile and Whippet are all going very well. Chevrolet, Oakland and Pontiac have been going at top speed for months. Oldsmobile has exceeded all previous records for production and shipment. The company will have produced more than 8,000 cars for domestic shipment in the month of March.

The Detroit Auto Club, which, in a measure, is considered an index of the prosperity of the city and state, is the largest of all the 1,000 A.A.A. clubs in the country, both in size and in rate of growth.

BUFFALO

There are evidences in the machine tool trade of Buffalo that March is not going to produce as good a volume of business as did February despite some indications to the contrary earlier in the month. In the third quarter of the month, however, there was a greater flurry of inquiries and predictions for a good spring business were quite current among dealers. Sales have chiefly occurred in small orders.

In the electrical equipment field, conditions were practically the same as have been previously reported in recent weeks. There is fairly general buying in small orders for industrial purposes, to be used in replacement or in minor alterations and improvements in industry.

The contractors' field continues extremely dull but it is expected that by April 1 there will be a marked upward trend here. A late spring has undoubtedly held up business in this field but a break in weather conditions will undoubtedly stimulate a resumption of business, particularly in road building equipment.

NEW YORK

Conditions in the machine tool market in the metropolitan district in the past week have been spotty in that not everyone has shared in what orders were placed. As in the case of the first week in March, there was a decided falling off in the quantity of business placed by some of the well-established firms. For at least two dealers, however, the past week's business has been abnormally high. Few big lists were closed to any one concern, and most of the activity was in medium-sized tools. The only large machines sold were second hand. Buying of small tools has been slow for some time, one of the reasons being that there seems to be little doing in the small shops.

The outstanding business of the month was undoubtedly the order placed by the Theodore A. Crane's Sons Co., of Brooklyn, to replace equipment destroyed by fire last fall. The list included two Cincinnati shapers, eight Sidney lathes, an Acme bolt cutter, two Cincinnati Bickford radials of 5 and 6 ft. capacity, and some second-hand machines, including a 25-ft. planer, a turret lathe and a milling machine. The New York Central R.R. also bought some radial drills in the past week for its Dunkirk and West Albany shops, as did a structural shop, in the latter case four 7-ft. radials. The Merganthaler Linotype Co. still continues to be a good buyer, most of the orders now being for tooling for equipment already bought, although some production lathes were among the items listed. The Hyatt Roller Bearing Co. is also said to have placed some machine tool business lately, as has the International Motor Co., which bought some more production lathes. The General Electric Co. continues to issue scattered orders, but no large lists have been noted. The Otis Elevator Co. is said to be in the market for a large amount of equipment for its Canadian plant.

Among the second-hand equipment sold in the last week were three large Pond planers, 3x3x12 ft., 12x10x26 ft., and 6x6x36 ft.; a 16-in. lathe, a 3-spindle drill, and a 6-in. spindle floor borer. Most of these tools went into cities in Pennsylvania.

CHICAGO

Business in machine tools for the last week remains on about the same level as that of the week preceding. Dealers report a steady, though moderate, demand for a wide variety of machinery equipment, and an increasing number of inquiries. Manufacturers of farm machinery and tractors continue in the lead as large buyers, the International Harvester Co. and John Deere & Co. being important factors in the market. The former has closed out a number of items on lists issued several weeks ago for its Rock Island and West Pullman plants. Buying on the part of John Deere & Co. has chiefly been for its Waterloo, Iowa, plant.

The railroad situation is getting into better shape. The Santa Fe has closed on a number of the tools listed several weeks ago, and the indications are that the remaining items on these lists will soon be accounted for. The most important railroad development of the week is the coming into the market of the Union Pacific with initial lists of a machine tool budget which it is reported will run into big figures. The Burlington has added to its recent buying, having placed orders for some grinders and welding machines.

Dealers in used tools are doing a satisfactory trade, which it is expected will improve as the year advances.

Conference on Industrial Gas Well Attended

Proper design to meet given conditions, complete automatic control, and the acceptance of the gas furnace as a machine tool, were the outstanding points brought out at the second Conference on Industrial Fuels, held at New Haven, Conn., March 21. The conference, which was attended by about 150 representatives of manufacturers, was under the direction of the Joint Research Committee of the Manufacturers' Association of Connecticut and Yale University, with the co-operation of the American Gas Association.

Speaking of furnace design, E. G. de Coriolis, of the Combustion Utilities Corporation, said that the user too often tries to design his own furnace without adequate understanding of the problem. Great strides have been made during the past few years, he pointed out, in materials for furnaces, including heat-resistant alloys and refractories as well as in methods of controlling furnaces.

In a paper by S. P. Rockwell, of the Stanley P. Rockwell Co., it was pointed out that the gas furnace can be controlled as easily as the electric furnace, and that the same type of instruments are used. The speaker stated that while electric furnaces have ordinarily but one heating rate, the gas furnace can be varied at will by adjustment of the valves. Moreover, the gas furnace costs less than the electric furnace for the same capacity, and is usually cheaper to operate. Automatic control can be applied to any type of gas furnace.

The slides shown with the various papers illustrated the most modern types of furnaces for carburizing, hardening, tempering, enameling, and other operations where heat is required. The other papers delivered at the conference were: Gas Furnace Construction, by W. Paul Eddy, Geometric Tool Co.; Combustion Characteristics of Coke, by L. E. Seeley; Fundamental Facts in the Coke Forming Process, by Prof. H. A. Curtis; Industrial Use of the Gas Furnace, by H. F. Cosgrove, The Wallace Barnes Co.; Gas Carburizing, by R. W. Woodward, the Stanley P. Rockwell Co.; Availability and Uses of Coke, by H. J. Rose, The Koppers Co.; Oil Producer Gas, by A. J. Bassett, The Bruce Macbeth Engine Co.; Coal Producer Gas, by Victor Windett, Wellman, Seaver, Morgan Co.; Gas-fired Core-baking and Japanning Ovens, by M. B. Webber; Looking Ahead with Industrial Gas and Coke, by Henry O. Loebell, The Surface Combustion Co. The day sessions were presided over by Prof. H. L. Seward, of Yale University, and the evening session was under the direction of A. H. D'Arcambal, of the Pratt & Whitney Company.

Albert Atkins Dowd Dies

Albert Atkins Dowd, author of many articles in the *American Machinist*, and co-author of "Tool Engineering," died March 15, in Detroit, after a brief illness. He was connected with the Chrysler Motors Corporation as tool engineer at the time of his death. Prior to that he had been for many years in the machine tool industry with Bullard and Pratt & Whitney, and as an engineer with Miller, Franklin, Basset & Co. He is survived by his wife and four children. Interment was at East Berlin, Connecticut.

Personals

EINAR RYDEN, formerly connected with the Northwest Engineering Co., Green Bay, Wis., now is associated with the Link Belt Co., of Chicago, Ill., as machine designer.

THOMAS ADDISON has resigned as designing engineer of the Cincinnati Planer Co., and accepted a similar position with the Cincinnati Bickford Tool Co., both of Cincinnati, Ohio.

JACOB NILSON has been elected president and treasurer of the A. H. Nilson Machine Co., Bridgeport, Conn., manufacturer of wire chain and special machinery. He succeeds his late father.

W. A. SLATER has just been appointed research professor of engineering materials and director of the Fritz Engineering Laboratory in the department of civil engineering at Lehigh University.

J. B. HAMILTON has opened an office at 231 Journal Square, Jersey City, N. J., to engage in the sale of new and used machinery. His line will include machine tools, plate rolls, punches and shears, air compressors, pumps and contractors' machinery.

BERTRAM W. BURSELL, formerly manager of the Packard Motor Car Co. plant at Detroit, Mich., has been appointed president of Sargent & Co., New Haven hardware manufacturers. Mr. Bursell also has headed major industries in Buffalo and Ontario within recent years.

JACOB F. SAVELA has been appointed welding service manager for its Detroit district by the Lincoln Electric Co., of Cleveland, Ohio, and will work under the direction of J. M. Robinson, district sales manager. Mr. Savela is a graduate of the University of Michigan and has had a wide practical experience.

HERBERT HOOVER has been appointed a member of the endowment committee for Engineering Foundation and Engineering Societies Library and its executive sub-committee, it recently was announced by the Engineering Foundation at the meeting of the board of trustees of the United Engineering Societies.

JULES DIERCKX, for the past 24 years connected with the Keller Mechanical Engineering Co., is sailing on March 31 for an extended trip abroad. His fixed address will be No. 1 Place Teniers, Antwerp, Belgium. He will attend to the European interests of the Keller company and also those of the W. F. & John Barnes Company.

R. C. BIRD has been appointed traveling sales manager of the D. O. James Manufacturing Co., Chicago, Ill., makers of all types of speed reducers and cut gearing. Mr. Bird formerly was with the Chain Belt Co., of Milwaukee. He will handle speed reducers for specialized jobs.

LEE FOX was elected president of the Fox Expansion Piston Co., Rock Island, Ill., at its annual meeting of directors. Authority for expansion of the plant and plans to increase production there was given. Mr. Fox also was elected treasurer of the company. Other officers are: Mrs. John H. Hauberg, vice-president; G. B. Chapman, secretary.

W. J. BORST, who has been with Deere & Co. 16 years and lately master mechanic at the John Deere Harvester Works, East Moline, Ill., has been advanced to acting superintendent of the plant, C. N. Stone, manager, announced this week. He succeeds the late C. Arthur Schoessel. Roland C. Tolmie continues his duties as assistant superintendent of the plant.

BENJAMIN HACKER, specializing since 1919 in the marketing of automotive products abroad, announces the removal to larger offices at 280 Broadway, New York City, and the opening of a private showroom for a permanent display of his lines for the convenience of overseas buyers. Mr. Hacker is export manager for "Husky" wrenches, "Hunt" gear pullers and several automotive parts.

CHARLES W. BEAVER has been elected president and treasurer of the Lockwood Manufacturing Co., South Norwalk, Conn., hardware manufacturer, to succeed George H. Lockwood, who is retiring because of ill health. Gen. Russell Frost was elected vice-president and Nelson T. Hayes, secretary and assistant treasurer. Mr. Beaver was formerly foreign representative for Yale & Towne.

WILLIAM F. BECKLEY, secretary, treasurer and general manager of the Michigan Automotive Supply Co., Detroit, Mich., has announced a complete re-organization of the company. He has purchased the interests of William E. Hawkins and Walter Mathews. The company has entered the

replacement parts field and is now making a specialty of replacement parts and shop equipment. Colin Campbell has been retained as sales manager.

C. IRVING DWINELL, has been appointed manager of the Boston branch of the United States Tool Co., of Cincinnati, Ohio, with headquarters at 514 Atlantic Ave. Following his graduation from Tufts College, Boston, Mr. Dwinell served as an electrical engineer with the General Electric Co., of Lynn, Mass., and at Schenectady, N. Y. He later connected with the Cleveland Terminal Co., in a similar capacity, following which he became purchasing agent of the B. F. Goodrich Rubber Co., of Akron, Ohio.

E. E. ARNOLD, after an absence of 20 years, has again become associated with the Westinghouse Electric & Manufacturing Co., in the capacity of mechanical engineer for special assignment duty. Mr. Arnold has a background of 30 years' experience in designing, testing and executive capacities pertaining to mechanical engineering. In 1898 he was graduated from the Ohio State University, following which he spent ten years with the Westinghouse Machine Co. During this time he assisted George Westinghouse in the development of the high-speed two- and four-cycle gas engines. Later he became engineering assistant to the vice-president.

ALBERT C. MARBLE, superintendent of the Curtis & Marble Machine Co., Worcester, Mass., has been elected president of the National Metal Trades Association at its twenty-seventh annual business meeting held recently in Worcester. Other officers elected were John C. Spence, Norton Co., vice-president; William Arter, Arter Grinding Co., treasurer. Those elected to serve on the executive board were F. A. Ball, L. S. Starrett Co., Athol, Mass.; Richard C. Fosdick, Fitchburg Steam Engine Co., Fitchburg, Mass.; Elliot J. McKnight, L. G. McKnight Co., Gardner, Mass.; Charles A. Clarke, Universal Boring Machine Co., Hudson, Mass.; and the following, all of Worcester: J. J. Adams, J. J. Adams Co.; H. S. Wright, M. S. Wright Co.; Philip M. Morgan, Morgan Construction Co.; Fred S. Morton, Matthews Manufacturing Co.; William B. Smith, James Smith & Sons, and Fred W. McIntyre, Reed-Prentice Co.

Business Items

The Bentley & Holmgren Co., Bridgeport, Conn., has been appointed to represent Foote Bros. Gear & Machine Co., in Connecticut and western Massachusetts.

The Brown Instrument Co., of Philadelphia, Pa., has secured larger quarters for its Detroit branch in the Maccabee Building. R. W. Mayer, district manager is in charge.

The Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, announces the appointment of Leeds, Tozzer & Co., Inc., 75 West St., New York, as representatives of its tramrail system in Manhattan, Bronx and Staten Island, and New York City.

The Acme Wire Co., New Haven, Conn., has announced the resignation of Leonard S. Taylor, vice-president in charge of production, and the election of Edgar L. Hartpence as vice-president to succeed Victor M. Tyler as general manager. Mr. Tyler continues as president of the company.

The Gross & DeLeeuw Co., of Kensington, Conn., re-elected the following officers at its recent annual meeting of stockholders: Stanley P. Goss, president and treasurer; A. L. DeLeeuw, vice-president; John S. Black, secretary, and A. J. Crozier, assistant treasurer. The regular quarterly dividend of one quarter per cent was declared.

A foremen's club has been organized by foremen in Decatur, Ill., industrial plants as outgrowth of the series of factory executives' safety smokers just concluded. H. E. Burg is head of the committee preparing plans for the new organization. James A. Melrose, Millikin University; Dr. A. F. Goodyear and S. T. Lowry, fire chief, were speakers at the preliminary meeting.

The William Hamilton Sons Car Co., of Newark, Ohio, is in liquidation and the entire plant, land and buildings, machinery, equipment, tools, dies, etc., will be sold at absolute public auction on April 10 and 11, 1928. The Hamilton company was the successor to the Jewett Car Co., which had been in business for more than 30 years. The receivership was declared Nov. 1 last.

The American Pulverizer Co., manufacturer of the American rolling ring crushers, has moved from 18th and Austin Streets, St. Louis, Mo., to a new, modern plant at 1249-53 Macklind Ave., that city. The new plan has about 12,000 square feet of floor space and is equipped with the most modern machinery. It is said that the company now is in a position to better than double its former production.

The Worthington Pump & Machinery Corporation announces the removal of its executive offices, export sales department and New York district sales department from 8 West 40th St. to 2 Park Ave., New York City, on or about April 1. Worthington also has moved its head office, advertising and sales departments to the Harrison plant of the corporation located at 421 Worthington Ave., Harrison, N. J.

At the recent annual meeting of the Stevens Walden-Worcester, Inc., Worcester, Mass., the following officers were elected: Louis Schwab, president; John Macauley, treasurer; J. V. Critchley, chairman of the board of directors. Mr. Critchley formerly was president as well as chairman of the Worcester concern and Mr. Schwab was head of Stevens & Co. of New York prior to the consolidation. The company is opening a Pacific Coast office and warehouse at 435 Bryant St., San Francisco.

Obituaries

HALWARD G. WESTMORE, general foreman of the A. O. Smith Corporation, Milwaukee, died recently in his 75th year. He was born in Norway and immigrated to America in 1863, joining the Smith interests in 1895. Mr. Westmore was an authority on machine tools and designed much of the equipment of the Smith plant.

GAETANO LANZA, consulting engineer for fifteen years with the Baldwin Locomotive Works, Philadelphia, Pa., died recently at his home in that city after a short illness, in his 80th year. Professor Lanza held a professorship in the Massachusetts Institute of Technology, heading the department of mechanical engineering there from 1883 to 1911, when he became professor emeritus.

ELIPHALET PLATT STRATTON, retired marine engineer, naval architect and inventor, died recently in his 83rd year. He was connected with the George Quintard Iron Works of New York and the New York Mail Steamship Co. He also was chief engineer for the New York & West Indies Steamship Co., and an inspector of steam vessels for the Port of New York Authority. For a time he was chief engineer of the American Bureau of Shipping and a member of its board of governors.

WOLCOTT REMINGTON, vice-president and a director of Thomson Electric Welding Co., Lynn, Mass., died at the age of 53 on March 20 after a short illness of pneumonia. Mr. Remington graduated from the Massachusetts Institute of Technology in 1900. During the World War he was presented a medal by the British Government for notable achievements in the protection of munitions while head of a munition plant in Canada. In 1922-23 he was president of the National Metal Trades Association.

JAMES WARREN PACKARD, pioneer of the automobile industry and formerly president of the Packard Motor Car Co., Detroit, Mich., is dead after an illness of two years. He was in his 64th year and had been in retirement for a number of years at his home in Warren, Ohio. Returning to Warren from New York in the early '80's Mr. Packard founded the Packard Electric Co. From lamps he went to internal combustion engines in 1900 and three years later interested Detroit capital in the manufacture of an automobile embodying that type of motor.

PROFESSOR WILLIAM FREEMAN MYRICK GOSS died recently at his suite in the Waldorf Hotel, New York City, in his 68th year. Educated at the Massachusetts Institute of Technology, he organized the department of practical mechanics at Purdue in 1879, finally becoming dean of the school of engineering. He left Purdue in 1907 to become dean of the college of engineering at Illinois. He remained there until 1917 when he was made president of the Railway Car Manufacturers' Association, from which he retired in 1925. He was a member of several scientific societies and wrote extensively on locomotives.

Forthcoming Meetings

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April 19, 20 and 21, Hotel Seneca. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

American Society of Mechanical Engineers. Spring Meeting, May 14-16, Pittsburgh, Pa. Calvin W. Rice, secretary, 39 West 39th St., New York City.

Southern Supply & Machinery Dealers' Association. Will meet in annual convention in Nashville, Tenn., May 15, 16 and 17 jointly with the **National Supply & Distributors' Association** and the **American Supply & Machinery Manufacturers' Association.**

American Foundrymen's Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

American Railway Association. Schedule of sectional meetings: Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J. Division VII, Electrical, Sept. 22 to 28, Cleveland, Ohio. J. W. Welsh, secretary, 292 Madison Avenue, New York City.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.
"National Metals Exposition," Commercial

The Weekly Price Guide

Rise and Fall of the Market

STEEL buying continues in fairly large volume for construction purposes, automobile and agricultural implement manufacturing and gas pipe-line work, except in large diameters. Steel sheets dropped 10c. per 100 lb. on black and blue-annealed, at Pittsburgh mills, during the week. There is improvement, however, in cast-iron pipe demand, with tendency to advance prices. Copper bars declined 1c. per lb. at Cleveland, following a similar change last week at New York warehouses. Improvement in the non-ferrous metals market is seen in higher prices for scrap copper and zinc, here and in the West. Wiping cloths advanced 1½c. per lb. at New York, following a smaller rise one week ago.

(All prices as of March 23)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.50	3.25	3.89
No. 12	2.05@2.15	3.55	3.30	3.94
No. 14	2.10@2.20	3.60	3.35	3.99
No. 16	2.20@2.30	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.60@2.70	3.75	3.55	4.00
No. 22	2.75@2.85	3.90	3.70	4.15
No. 24	2.80@2.90	3.95	3.75	4.20
No. 26	2.90@3.00	4.05	3.85	4.30
No. 28	3.05@3.15	4.20	4.00	4.45
Galvanized				
No. 10	3.05	4.10	3.90	4.25
Nos. 12 to 14	3.15	4.20	4.00	4.35
No. 16	3.25	4.30	4.10	4.45
No. 18	3.40	4.45	4.25	4.60
No. 20	3.55	4.60	4.45	4.75
No. 22	3.60	4.65	4.50	4.80
No. 24	3.75	4.80	4.60	4.95
No. 26	4.00	5.05	4.85	5.20
No. 28	4.25	5.30	5.10	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

WROUGHT STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—B.w.g. and Decimal	Fractions	Outside Diameter in Inches—⅛ Price per Foot	¼	⅜	½	⅝	¾	⅞	1	1¼	1½
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23			
.049″	18	.17	.18	.19	.20	.21	.23	.25			
.065″	16	.19	.20	.21	.22	.23	.25	.27			
.083″	14	.20	.22	.23	.24	.25	.27	.29			
.095″	13	.21	.23	.25	.26	.27	.29	.31			
.109″	12	.22	.24	.26	.27	.28	.30	.32			
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33			
.134″	10	.24	.26	.28	.29	.30	.32	.34			

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 5/16@½-in. thick. †Cold finished steel, shafting and screw stock.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, New York			15.00
Tin, pigs, New York			53.00
Lead, pigs, E. St. Louis	5.82½	New York	7.25
Zinc, slabs, E. St. Louis	5.67½	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs	12.75	13.25	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.37½	16@16¼*
Copper bars, base	21.25	21.25	22.25
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	27@28	22¾@24*	24.03*
Zinc sheets (casks).....	10@10½	12.65	10.36
Solder (½ and ½), (case lots).....	33.25	32.50	33@37
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade.....			69.00
Commercial genuine, intermediate grade.....			57.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots..... 35.00	Electrolytic.. 37.00	Shot.....	36.00

*F.o.b. producing point.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper.....	12.25 @12.50	11.50	11.25@11.75
Copper, heavy, and wire.	11.50 @12.25	10.75	10.75@11.25
Copper, light, and bottoms	10.25 @10.75	9.50	9.50@10.00
Heavy lead.....	4.75 @ 5.00	5.25	4.25@ 4.75
Tea lead.....	3.50 @ 3.75	3.75	3.25@ 3.75
Brass, heavy, yellow.....	7.00 @ 7.25	7.25	7.00@ 7.50
Brass, heavy, red.....	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings.	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc.....	3.12½@ 3.37½	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.10	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.‡	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.‡	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.16¾@.17½	38.00 per M	.15
Sal soda, per lb.....	.02	.02	.02¾
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots.....	.76½	.84	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal....	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.27	.36	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.			
Medium grade.....	35%	35%	35%
Heavy grade.....	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade.....	45%	50–10%	50%*
Second grade.....	50%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60–10% ‡Bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb....	$0.0324	$0.0324	$0.0324
Cold drawn shafting....	per lb....	.034	.033	.04
Brass rods.....	per lb....	.165	.165	.1612½
Solder (½ and ½).....	per lb	.3325	.3425	.425
Cotton waste, white....	per lb....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.55
Machine oil.....	per gal...	.27	.27	.33
Belting, leather, medium.....	off list....	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
*Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.65@3.00
Coke, prompt foundry, per net ton...	Connellsville,		3.75@4.50
White lead, dry or in oil....	100 lb. kegs....	New York,	13.75
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York.	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Reading—P. O. Box 96—machine shop equipment including lathes, shaper, etc.

Mich., Ann Arbor—King Seeley Co., 294 Second St.—machine shop equipment for finishing small gage parts for proposed 5 story, 60 x 85 ft. gasoline gage factory on Second St. Estimated cost $85,000.

Mich., Detroit — Commonwealth Brass Co., 6781 Commonwealth Ave.—machine equipment for making small brass castings, etc. for proposed addition to factory.

Mich., Detroit—East Side Gear & Tool Co., 2981 Charlevoix Ave.—one shaper.

Mich., Detroit — Teer, Wickwire & Co., 3558 Garfield Ave. (screw products)—chamfering machine.

Mich., Saginaw—Saginaw Malleable Iron Works — machinery and equipment for finishing iron castings for proposed 1 story, 80 x 90 and 80 x 110 ft. foundry and factory on Florence Ave.

Mo., St. Louis — General Brake Service Co., 2427 Locust Blvd.—welding outfit for garage work.

O., Cleveland — L. Lehmann, 3409 East 93rd St.—16 or 18 in jointer, also large disk sander for pattern shop.

O., Columbus—Seagrave Corp., 2000 South High St., W. E. Lee, Secy. and Mgr.—machinery and equipment including seven lathes, grinding machines, drill presses, etc. for addition to factory now under construction.

O., Denver — Stearns Rogers Mfg. Co., 1720 California St.—universal tilting table, 48 to 60 in.

Pa., Albion—Rogers Bros. Corp.—42 in. vertical boring mill.

Pa., Graterford—Bd. of Trustees, Eastern Penitentiary—will receive bids until Apr. 2 for one full caterpillar full swing gasoline driven crane with 60 ft. boom and special 10 ft. goose neck extension.

Pa., Reading—Textile Foundry Machine Co.—five 5 ton overhead electric cranes.

Wash., Wenatchee — Great Northern Ry. Co., Railroad Bldg., St. Paul—traveling crane for proposed 82 x 192 ft. electric locomotive repair shop, here.

W. Va., Wheeling—Wheeling Steel Corp. —two 200 ton electric cranes.

Ont., Hamilton — Shambrook Metalware Ltd., W. D. Shambrook, Mgr., Duro Aluminum Co.—machinery and equipment for the manufacture of galvanized household articles, pails, tubs, etc. for plant. Estimated cost $25,000.

Opportunities for Future Business

Calif., Glendale — Bd. of Education, awarded contract for the construction of a group of high school buildings including a 1 story, 16 x 290 ft. shop building, etc. on Glenwood Rd. Estimated cost $796,400.

Calif., San Bernardino—O. L. Cowan, c/o J. P. Perrine, Lincoln Bldg., Los Angeles, archts., awarded contract for a 1 story, 300 x 450 ft. sales and service station here. Estimated cost $150,000.

Calif., San Jose—A. Pratt, c/o Wolfe & Higgins, Realty Bldg., Archts., is having plans prepared for a 1 and 2 story machine shop at 6th and John Sts. Estimated cost $11,000.

Conn., Hartford — Connecticut Co., 185 Church St., New Haven, is having plans prepared for a 1 story, 97 x 130 ft. garage on Vernon St. here. Estimated cost $60,000. R. W. Foote, 185 Church St., New Haven, Archt.

Conn., Oakville—Smith Seymour & Son, Inc., manufacturers of hardware, awarded contract for a 2 story, 50 x 150 ft. factory. Estimated cost $75,000.

Ill., Chicago—Capitol Plumbing & Heating Supply Co., 731 North Wells St., awarded contract for a 2 story factory and warehouse at Clybourn, Ashland Ave. and Chester St. Estimated cost $100,000.

Ill., Chicago—D. D. Meredith, 222 West Adams St., Archt., will soon receive bids for a 10 story, 80 x 160 ft. garage at Lake and Dearborn Sts. for G. E. Holmes, 34 East Lake St. Estimated cost $1,000,000. Noted Nov. 10.

Ill., Chicago — L. F. Muter & Co., 1035 East 76th St., manufacturers of radio appliances, awarded contract for masonry, etc. for a 1 story, 90 x 144 ft. factory at 8426 South Chicago Ave. Estimated cost $45,000.

Ill., Chicago — S. Olson & Co., 2418 Bloomingdale Ave., manufacturers of elevators and conveyors, awarded contract for masonry, etc. for a 1 and 2 story, 135 x 260 ft. factory at Kostne Ave. and Division St. Estimated cost $150,000. Noted Feb. 9.

Ill., Chicago—H. Rubloff, 10 South La Salle St., is having sketches made for an 80 x 172 ft. garage at Wabash Ave. and Harrison St. A. S. Alschuler, 28 East Jackson Blvd., Archt.

Ill., Chicago—Western Architectural Iron Co., 211 West Schiller St., awarded contract for a 1 story, 100 x 132 ft. factory at 3451 Elston Ave.

Ill., Rockford—Ornamental Brass Shops, plans a 1 story addition to plant at Tenth St. and Tenth Ave. Estimated cost $40,000.

Ind., Connersville — Auburn Motor Co. awarded contract for the construction of a factory. Estimated cost $100,000.

Ind., Indianapolis — G. J. Mayer Co., 36 South Meridian St., stamp manufacturers awarded contract for a 50 x 150 ft. factory at Liberty and Market St. Estimated cost $40,000.

Ind., Indianapolis—Western Oil Co., c/o Bishop-Knowlton & Carson, 312 North Meridian St., Archts., awarded contract for the construction of a machine shop at Layman and East Washington Sts. Estimated cost $40,000.

Ind., Marion—Case Electric Co. is having plans prepared for a 137 x 140 ft. factory. Estimated cost $52,000. Private plans.

Ind., Richmond — Richmond Fireproof Door Co. will build an addition to factory. Estimated cost $40,000. Private plans.

Ind., South Bend — Bantam Ball Bearing Co., West Sample St., awarded contract for a 1 story, 100 x 200 ft. factory. Estimated cost $50,000.

Ia., Waterloo — John Deere Tractor Co. awarded contract for a 1 story, 120 x 120 ft. addition to tractor factory. Estimated cost $25,000.

Ky., Louisville—U. S. Foil Co., 30th and Grand Sts., awarded contract for a 1 story, 113 x 200 ft. addition to present group of factory buildings. Estimated cost $100,000. Bids will be taken later on another building. Estimated to cost $200,000 to $300,000. Noted Feb. 23.

Mass., Chicopee — Municipal Light Bd., will soon award contract for the construction of a repair and service garage on Front St. Estimated cost $85,000. Noted Mar. 1.

Mass., Fall River — Borden-Remington Co., 115 Anawam St., is receiving bids for a 1 story, 75 x 100 ft. repair and service garage on Pleasant St. Estimated cost $40,000. E. M. Corbett, 167 Bedford St., Archt. Noted Mar. 22.

Mich., Bay City — Chevrolet Motor Car Co., Flint, awarded contract for a 1 story, 225 x 900 ft. automobile factory on North Madison St., here. Estimated cost $450,000.

Mich., Detroit — Detroit Gray Iron Foundry, Iron and Wight Sts., awarded contract for a 1 story, 115 x 130 ft. foundry. Estimated cost $50,000.

Mich., Detroit — Wise Chrome Products Co., 2474 Bellevue Ave., awarded contract for a 1 and 2 story, 72 x 133 ft. metal products factory. Estimated cost $50,000. Noted Mar. 15.

Minn., Minneapolis—C. W. Olson Mfg. Co., 1300 Quincy St. N.E., manufacturers of ornamental iron, fire escapes, etc., awarded contract for a 1 story, 104 x 105 ft. factory to replace fire loss. Noted Mar. 1.

Mo., St. Louis—Associated Motors Terminal Co., c/o W. King & Associates, 11 South Broadway, awarded contract for a 6 story, 102 x 145 ft. garage at 13th and St. Charles Sts. Estimated cost $350,000. Noted Mar. 8.

Neb., Hastings — Jaden Mfg. Co., F. Jaden, Pres., hardware manufacturers, awarded contract for a 1 story, 120 x 250 ft. factory. Estimated cost $50,000.

Neb., Omaha — Chevrolet Motor Co., 6th floor, Standard Oil Bldg., awarded contract for a 2 story, 90 x 150 ft. garage and warehouse. Estimated cost $125,000. A. Kahn, 1000 Marquette Bldg., Detroit, Mich., Archt.

N. J., Dunellen—R. Hoe & Co., 504 Grand St., New York, N. Y., plans the construction of a 2 story factory, here. Estimated cost $100,000. Architec not selected.

N. J., Newark — Art Metal Works, 7 Mulberry St., is having sketches made for a 2 story addition to factory at Mulberry and Division Sts. Estimated cost $40,000. H. Baechlin, 665 Broad St., Archt.

N. Y., New York — W. J. Payne, 5120 Broadway, will build a 2 story garage. Estimated cost $100,000. J. E. Birmingham, 45 Warburton Ave., Yonkers, Archt.

N. Y., Syracuse—City plans the construction of shops and storerooms for water supply division on Erie Blvd. Estimated cost $100,000. N. F. Pitts, Jr., City Hall, Engr.

O., Canton—Timken Roller Bearing Co., Dueber St. S. W., awarded contract for a new open hearth extension, also soaking pit building. Estimated cost $500,000.

O., Cleveland—North American Mfg. Co., 8918 Frederick Ave., manufacturers of oil burners, awarded contract for a 1 story, 40 x 120 ft. factory at 2910 East 75th St. Estimated cost $40,000.

O., East Liverpool—Windland Bros. Lumber Co., Bradshaw Ave., awarded contract for a 1 story, 100 x 160 ft. garage at Minerva and Walnut Sts. Estimated cost $40,000.

Pa., New Castle—The Shenango Motor Co., will soon award contract for a 2 story, 90 x 150 ft. garage on West Washington St. Estimated cost $200,000. F. H. Foulk, Fairmont Cedar Bldg., Cleveland Heights, O., Archt.

Wash., Wenatchee—Great Northern Ry. Co., Railroad Bldg., St. Paul, Minn., plans the construction of an 82 x 192 ft. electric locomotive repair shop here. J. R. W. Davis, Ch. Engr.

Wis., Milwaukee—Argo Investment Co., 123 Wisconsin Ave., will soon award contract for a 6 story, 100 x 151 ft. garage at 5th and Michigan Sts. Estimated cost $300,000. R. C. Kurtz, 287 33rd St., Archt. Osthoff-Peterson Inc., 445 Milwaukee St., Engr. Noted Feb. 23.

Wis., Rhinelander—Wisconsin Veneer Co., J. Moen, Pres., awarded contract for a 1 and 2 story addition to factory. Estimated cost $100,000. Noted Dec. 29.

Ont., Hamilton—Cadillac Motor Sales, 776 King St. E., awarded contract for a 4 story, 100 x 137 ft. garage on Main St. Estimated cost $200,000.

Ont., Ottawa — I. Sugarman, MacLaren Apartment, will soon receive bids for a 3 story, 100 x 200 ft. garage on Rideau St. Estimated cost $225,000.

Que., Montreal — Canadian Pacific R R., plans the construction of a signal apparatus repair shop at Windor Station. engine houses at Glen Yards and Outremont, warehouse at Place Vigor Station, etc. Estimated cost $250,000. J. M. R. Fairbairn, Ch. Engr.